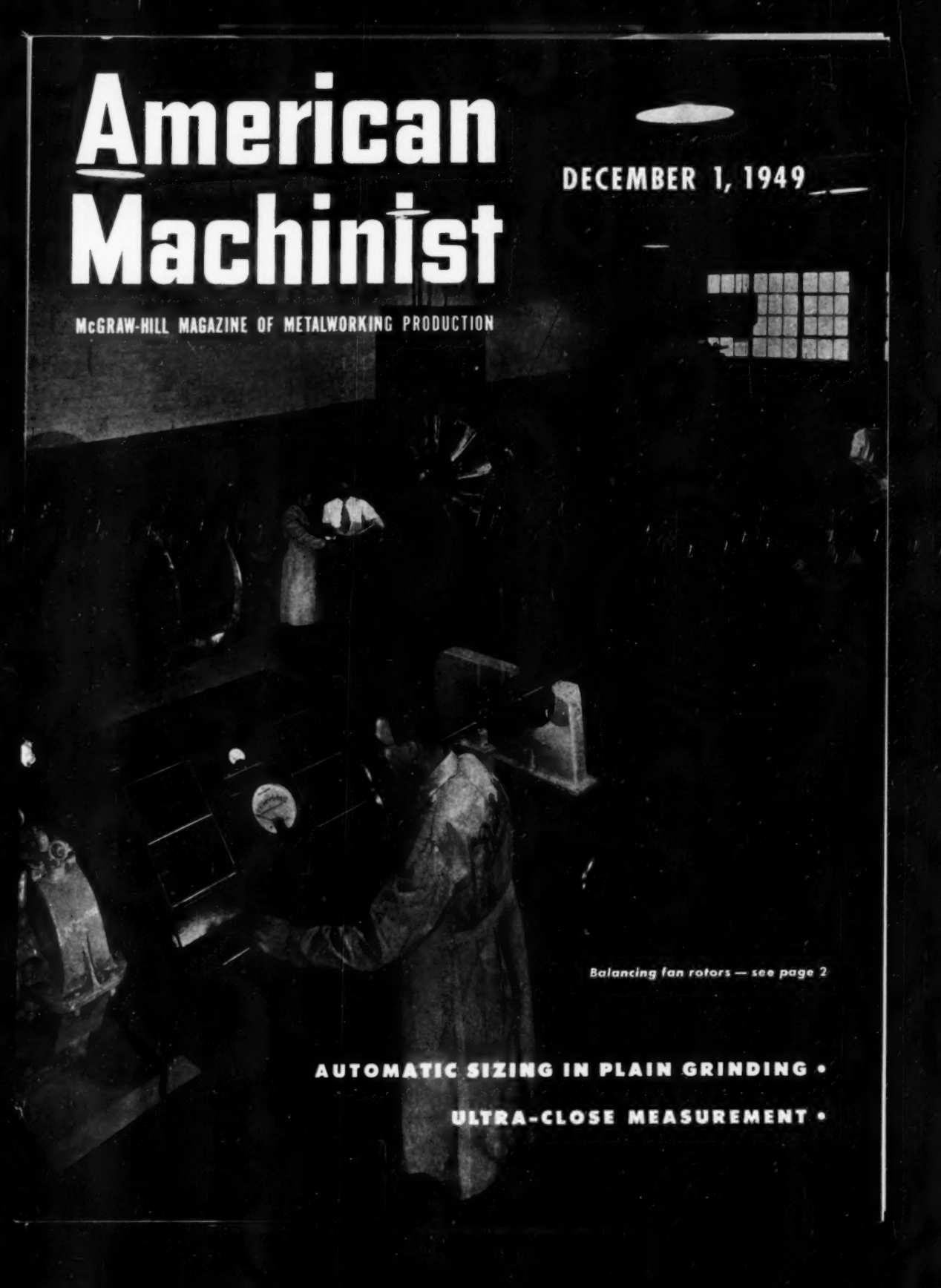
# American Machinist

DECEMBER 1, 1949

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



*Balancing fan rotors — see page 2*

**AUTOMATIC SIZING IN PLAIN GRINDING •**

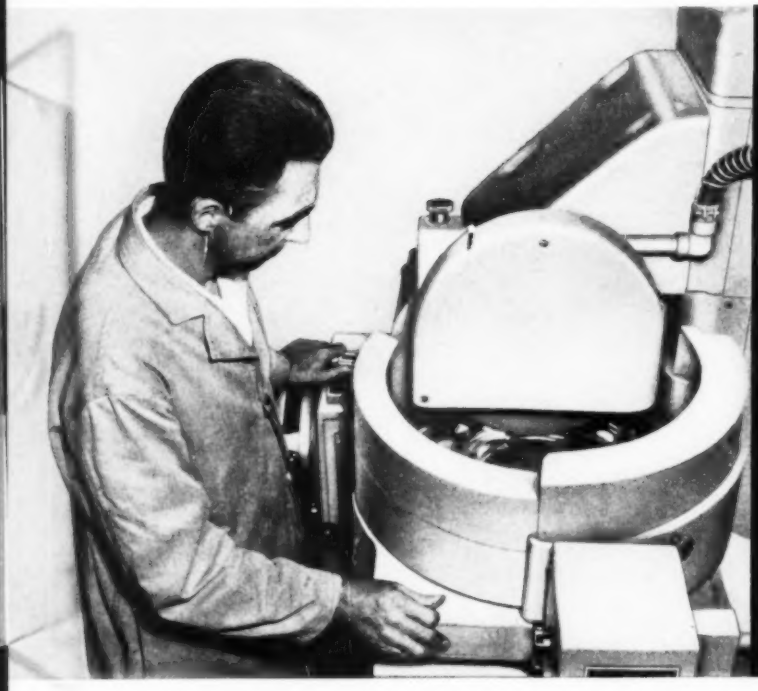
**ULTRA-CLOSE MEASUREMENT •**

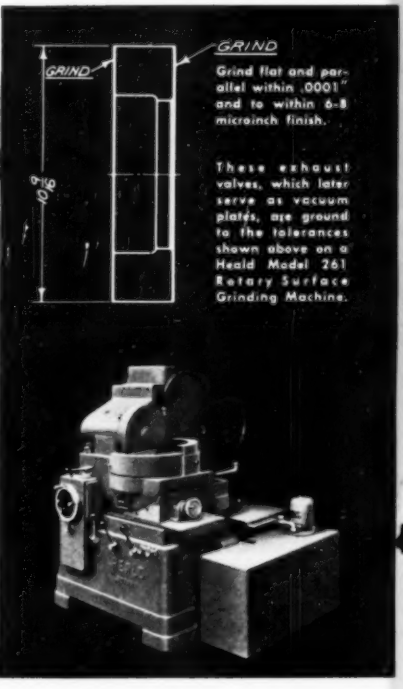
# LAPPING TIME CUT 75%

## because these valve parts are

# PRECISION - GROUND

## on the new Heald Model 261 Surface Grinder!






Grind flat and parallel within .0001" and to within 6-8 microinch finish.

These exhaust valves, which later serve as vacuum plates, are ground to the tolerances shown above on a Heald Model 261 Rotary Surface Grinding Machine.

Ordinarily it's a tough grind to get a work piece finished down to a flat and parallel tolerance of .0001" and 6 or 8 microinches. But to the new Heald Model 261 rotary surface grinder, such jobs are routine. That's why this machine enabled one manufacturer to cut final lapping time for precision exhaust valve parts by 75% — by doing a better, more accurate *grinding* job first.

This is typical of the many grinding problems that have been solved with the Heald Model 261 machine — providing greater precision, better finish, faster production and lower cost per part.

The vertical column design gives extra rigid support for the wheel slide and increased height for handling long work. Cradle-swiveled chuck permits you to grind concave or convex as well as flat surfaces. Levers and controls are arranged for maximum ease and speed of adjustment and operation.

Heald Model 261 Grinders are furnished as plain or automatic cycle machines. Your nearest Heald representative will be glad to help you with your precision finish problems on either surface or internal grinding.

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**PRECISION INTERNAL AND SURFACE GRINDERS**

**PRECISION BORE-MATIC FINISHING MACHINES**

**THE HEALD MACHINE COMPANY**
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# American Machinist

MAGAZINE OF METALWORKING PRODUCTION



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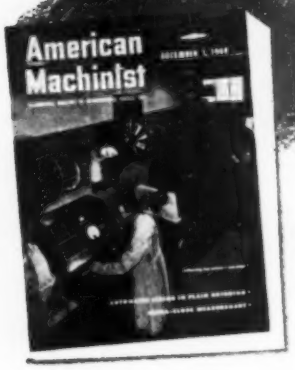



# Chips and Quips

***Our Cover*** . . . Accurate balancing of fan rotors is a necessary operation if the installation is to be free from vibration and bearing trouble. Buffalo Forge has a separate department for all balancing operations. Here rotors are placed on machines which dynamically measure and locate the unbalance. Operators then add corrective weights to bring the rotors into proper balance. The machine shown in the foreground is a Gisholt DYNETRIC Type 6U Balancer capable of handling rotors weighing up to 2000 lb. The Ektachrome photograph was made by Sherwin Greenberg of Buffalo.

***Automatic Sizing*** . . . More than a year ago, we began to investigate automatic sizing for plain or cylindrical grinding. It showed tremendous possibilities, for it was unusual among automatic processes in that it could be applied economically to small lots. As we dug further into it, we found that most makers of plain grinders had developed, or were developing, automatic sizing for their machines. Hence our story became first a roundup, then a Special Report. Included are details of all the known units, and an idea of what each will do.

***Tooling*** . . . In addition to the welding, automatic sizing and millionth-measurement articles we provide an explanation of how to machine hard, tough alloys, picture a group of special hook handlers from England, and continue J. R. Paquin's series with an article on die springs. There's also a short on a transfer feed and one on the use of cornstalk as a polishing medium.

***Millionths*** . . . When dimensions must be in millionths, even the measuring equipment may be outside tolerances—or local conditions can throw dimensions off. Bryant Chucking Grinder, facing this problem on internal grinding, had several surprises. After several years of experiments, the company has a laboratory technique for transferring millionth dimensions from a Jo-block standard to holes. It's not yet a production process, but it offers some ideas you will want. . . Also in this issue, Chester Ricker describes how unskilled women at the GMC Diesel Equipment Div. turn out tappet bodies and other parts to 50-millionths clearances. Techniques are based on diesel-injector practice utilized in the same plant. It includes the usual Ricker sketches.

***Buildings*** . . . George K. Kimball, equipment supervisor at the Sunnyvale plant of Westinghouse, has had much to do with remodeling existing buildings for modern production. We've gotten him to put down the principles, utilizing the recent rebuilding of the Hendy plant as his case in point. . . Also from Westinghouse is an article on a very different subject — welding spinner tubs for washers. It's a straight shop-technique explanation.

***Working Mag*** . . . Recent photo in the house organ of a big Chicago company shows two long-service employees looking over copies of technical magazines in the library. The house-organ editor says he planned to use *American Machinist* for one, but found that issues were not in the library, but out in the shop. When recalled, the issues were so dog-eared and worn from use that even our 4-color covers were no longer photogenic . . . Apology accepted: that's also the reason you see no *A.M.* on reception desks—too busy working.

***Coming*** . . . Optics in Metalworking will be the subject of our Special Report for Dec. 15. In that issue also will be a description of the Brown & Sharpe apprentice system and other management subjects such as the application of psychiatry in industry and a new vacation plan. . . For tool engineers, there's a description of a special scraper conveyor, the fundamentals of welding-fixture design, stories on disk grinding, automatic brazing, and hand lapping for unusual jobs. And J. R. Paquin continues with "Materials Layout for Economical Blanking." . . . Coming Jan. 23, 1950, our Mid-Century Review of shop equipment, materials, parts and supplies.

**PLANNER . . . A. C. Wedge, chief industrial engineer, Ozalid, Div. of General Aniline & Film Corporation, was graduated from the University of Minnesota in 1942 with a bachelor's degree in mechanical engineering. He became a junior industrial engineer with Aluminum Co. of America. A year later, he moved to Ozalid as production engineer, becoming department head in 1944 and chief industrial engineer in 1947. His present work includes production scheduling and control, inventory control, methods and estimating, tool control, and time study and standards.**

**Mr. Wedge has written several articles recently. His latest, and first in A.M., appears in this issue on tool planning. He is currently president of the Binghamton (N. Y.) Junior Chamber of Commerce.**

# GLEASON BEVEL GEARS

GLEASON
Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

*Builders of Bevel Gear Machinery for Over Eighty Years*

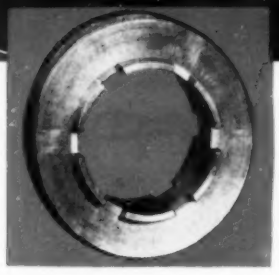
*A Cost Reducing Combination*

# Cincinnati Automatic Milling AND Automatic Two-Spindle Fixture

One style of sliding clutch, manufactured by a prominent eastern corporation, required six milled slots. To keep the cost of the operation in line with production, Cincinnati Application Engineers tooled up a CINCINNATI No. 1-12 Plain Automatic Milling Machine with a two-spindle automatic index fixture and suitable cutters, ready for production. The operator loads the fixture and trips the starting lever; then the automatic cycle takes over: advance, mill, retract, index and repeat for each slot. In addition to the obvious advantages of automatic indexing and milling two parts at one time, there are four advantages in this machine which are not apparent in the photograph.

1. Down-milling — a 1-12 standard feature
2. 300 in. per min. rapid traverse — a 1-12 standard feature
3. Dynapoise overarm — a 1-12 standard feature
4. Automatic spindle stop — a 1-12 standard feature

Many other standard features of value in performing 3 hp milling operations at low cost, on parts made in large or small quantities, are described in catalog M-1555. May we send a copy to you?



*Part name*.....Sliding clutch
*Material*.....Steel
*Operation*.....Mill six slots
*Speed*.....82 feet per minute
*Feed*.....9 inches per minute
*Production*.....38 per hour
*Equipment*.....CINCINNATI No. 1-12 Plain Automatic Milling Machine, with tooling by Cincinnati

CINCINNATI

CINCINNATI No. 1-12 Plain Automatic Milling Machine. Complete information on all features and their benefits may be obtained by writing for catalog M-1555.

## THE CINCINNATI MILLING MACHINE CO.

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MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

# *Where to start*

FILMATIC

## in Reducing Cost of Toolroom Grinding

Set-up time for a precision toolroom grinding job usually exceeds the grinding time by an appreciable amount. In fact, before the wheel actually touches the work, a cost handicap of 60% or more has accumulated. Find ways to reduce this set-up handicap and toolroom grinding costs go down fast. CINCINNATI FILMATIC Hydraulic Universal Grinders will help you achieve this desired result. Here are some of the reasons why:

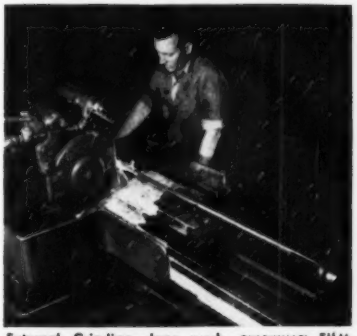
FILMATIC Grinding Wheel Spindle Bearings—require no adjustment for any quality of finish or stock removal.

Hinged internal grinding head—swing it down and tighten one bolt, that's all.

Speed Ranger headstock drive—instantaneous finger-tip selection of infinite number of speeds.

Two rates of manual table and cross traverse.

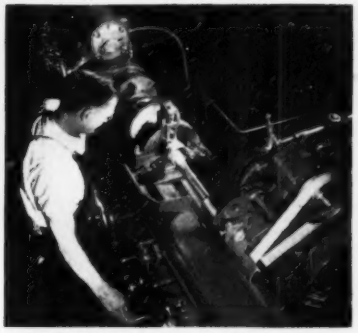
Other ways in which these machines will benefit your shop are outlined in attractive literature. It's yours for the asking.



External Grinding—long work. CINCINNATI FILMATIC 12" Hydraulic Universal Grinder.

External Grinding—short work. CINCINNATI FILMATIC 14" Hydraulic Universal Grinder.

CINCINNATI FILMATIC Hydraulic Universal Grinder. This style is made in three sizes: 12", catalog G-486-5, and 14" and 18", catalog G-474-3. Copies available at no obligation.



Internal Grinding—five sizes of spindle quills available. CINCINNATI FILMATIC 12" Hydraulic Universal Grinder.

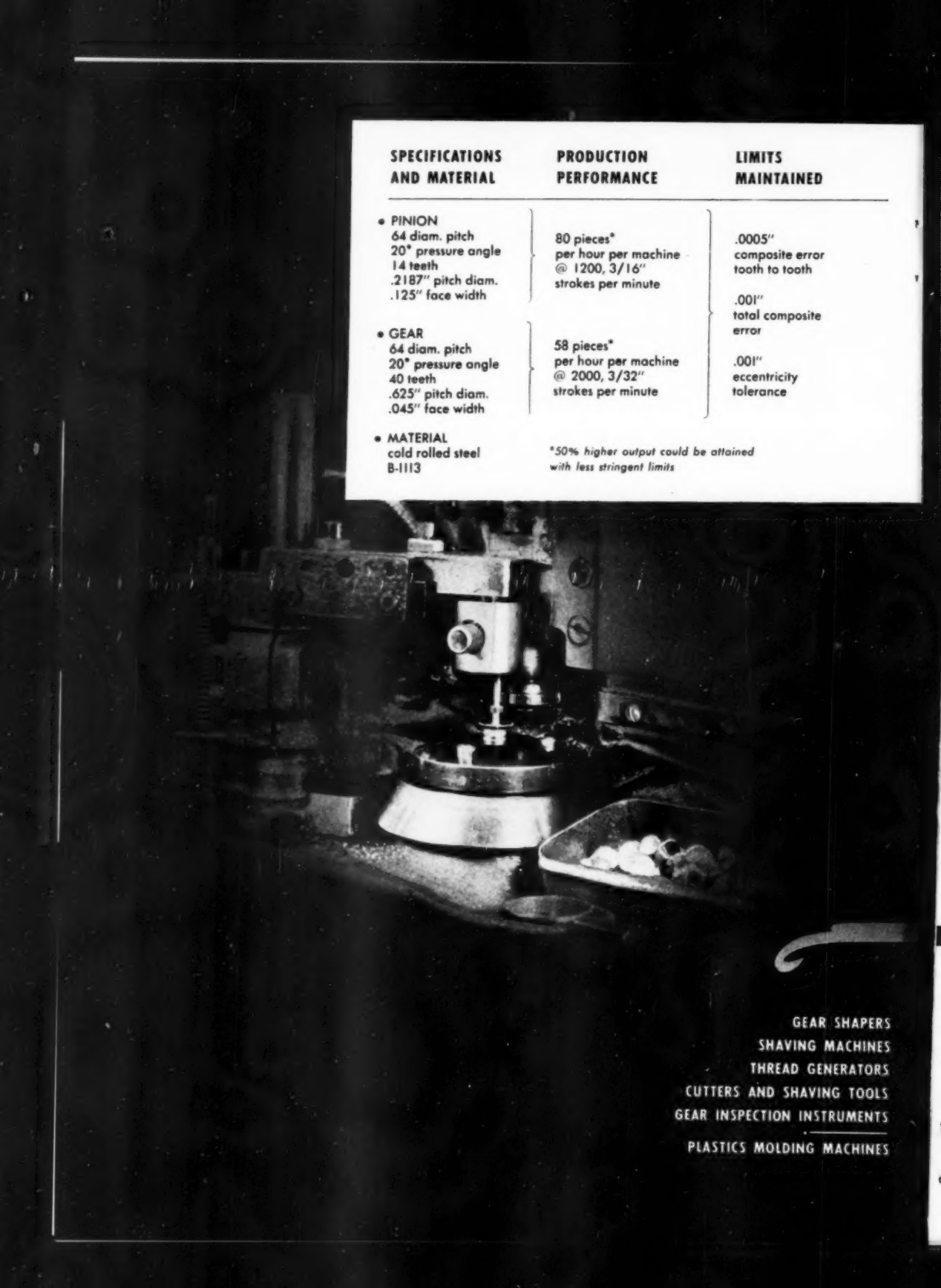
CINCINNATI

## CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

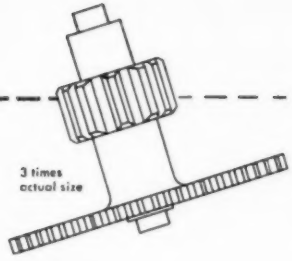
| SPECIFICATIONS AND MATERIAL | PRODUCTION PERFORMANCE | LIMITS MAINTAINED |
|---|---|---|
| • PINION<br>64 diam. pitch<br>20° pressure angle<br>14 teeth<br>.2187" pitch diam.<br>.125" face width | 80 pieces*<br>per hour per machine<br>@ 1200, 3/16"<br>strokes per minute | .0005"<br>composite error<br>tooth to tooth<br><br>.001"<br>total composite<br>error |
| • GEAR<br>64 diam. pitch<br>20° pressure angle<br>40 teeth<br>.625" pitch diam.<br>.045" face width | 58 pieces*<br>per hour per machine<br>@ 2000, 3/32"<br>strokes per minute | .001"<br>eccentricity<br>tolerance |
| • MATERIAL<br>cold rolled steel<br>B-1113 | *50% higher output could be attained with less stringent limits | |



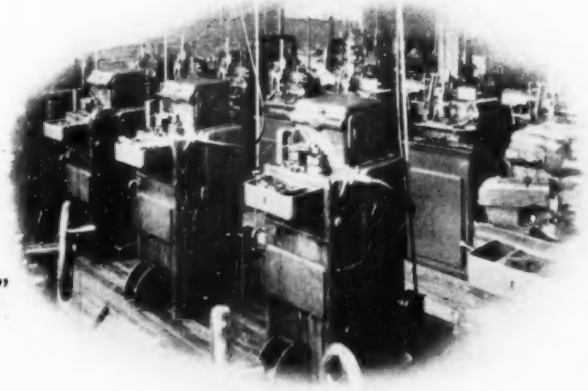
GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

# 64-PITCH GEAR TEETH




## to .0005" Limits at Low Cost



**Production on a battery of Fellows 3-inch Fine-Pitch Gear Shapers held to "cruising speed" to maintain finest quality at all times**

Instrument Gear Works in Chicago is a specialist in high quality instrument Gears. They have good reason to be proud of the customers they serve and the efficiency with which the required fine-pitch gear precision is maintained. The tabulation on the facing page is a typical performance.

The background of accuracy control at Instrument Gear Works is reliance on a group of Fellows Fine-Pitch Gear Shapers tooled with 64-pitch Original Fellows Cutters.

If you have a fine pitch or small gear job you owe yourself a thorough investigation of what can be obtained in both speed and accuracy from this Fellows 3-inch machine. We'll be glad to tell you where there are machines at work in your territory. Write the office nearest you.

*Fellows*

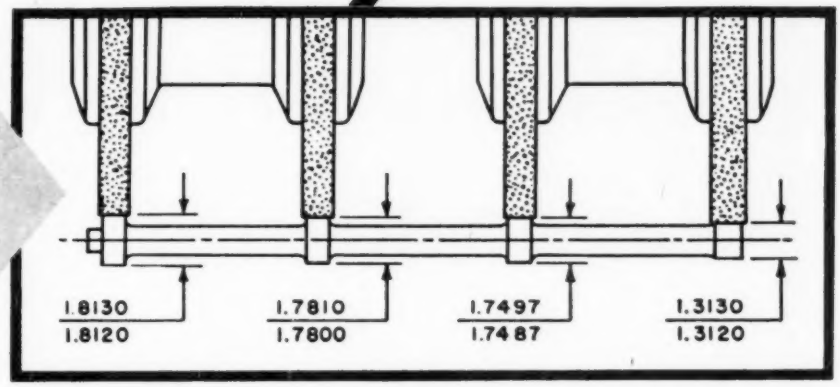
THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.

# Van Norman

## Automatically Grinds Four Crankshaft Bearings SIMULTANEOUSLY

VAN

# Fitchburg Grinder




If you want to cut grinding costs . . . if you want to get out more pieces . . . if you want to cut tooling costs — then Van Norman Fitchburg Cylindrical Grinders are the machines for you.

Typical of the low cost-per-piece mass production grinding performed on Van Norman Fitchburg Grinders is the illustration above where four camshaft bearings are ground simultaneously.

Each of the two standard Bowgage Wheelheads, one right-hand and the other left-hand, carries two spaced wheels on a wheel center. After the workpiece is loaded, the operator merely pushes *one* button and all four camshaft bearings are ground at the same time. All movements and correct sizing are completely automatic. The work stops rotating automatically, practically instantly, when the wheels withdraw. The operator unloads and loads the grinder and the next piece is ground.

If you have a mass production grinding problem, Van Norman will design and build a Van Norman Fitchburg Grinder that will cut costs for you, too. All we need do is simply take one or more Van Norman Fitchburg Bowgage Wheelheads . . . completely automatic integral grinding units with gauging, rough and finish feeds, and automatic cycling with rapid traverse . . . and mount them on a base best suited for your jobs.

Whether it's a standard or special purpose machine, it will pay you to investigate Van Norman Fitchburg Cylindrical Grinders.

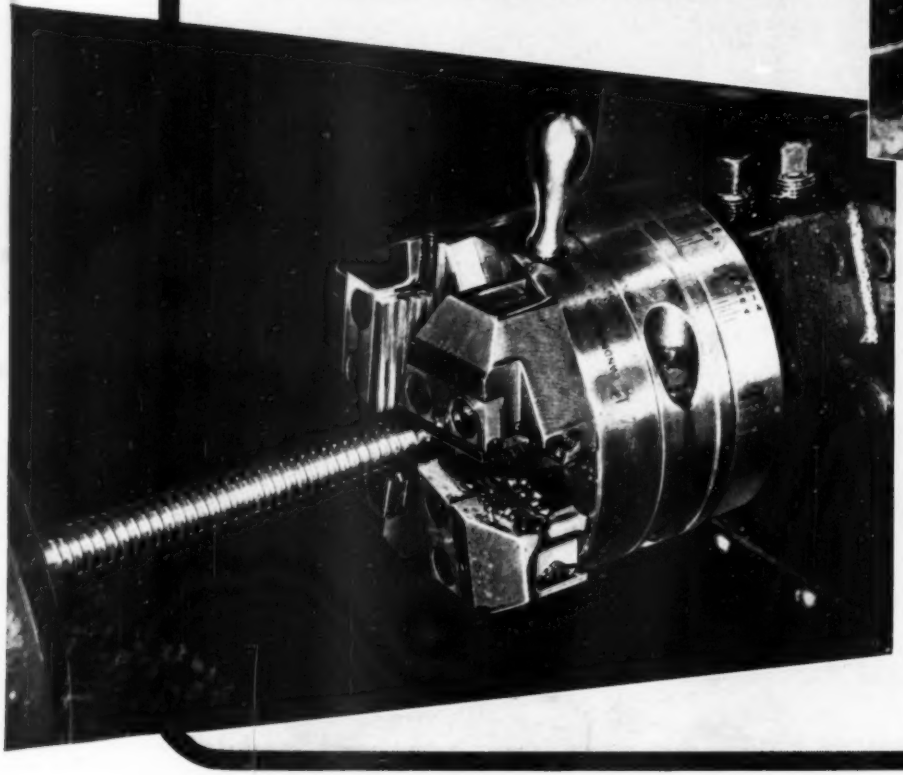
**NORMAN COMPANY**

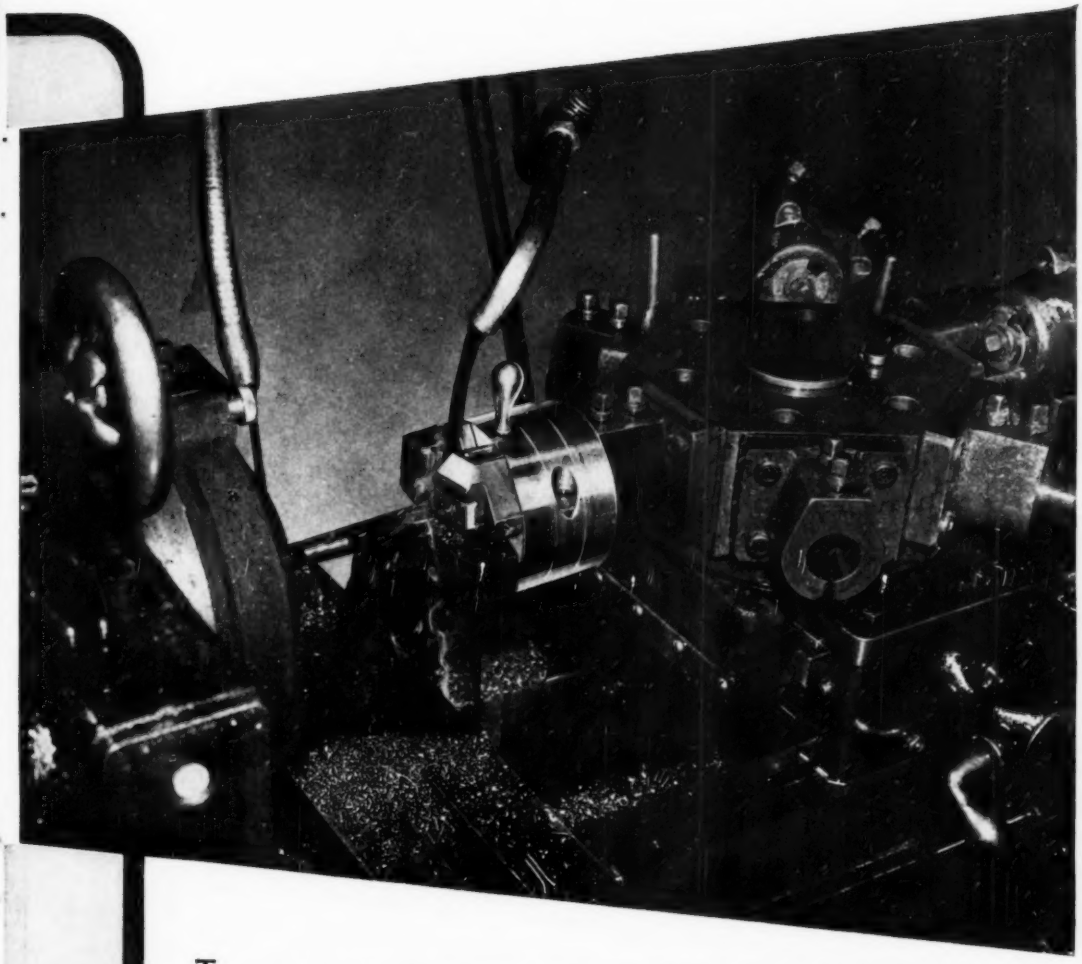
**SPRINGFIELD 7, MASSACHUSETTS**

*"It pays to Van Normanize"*

# 400% SAVING WITH *Landmatic* HEADS

- Cut thread in only one pass.
- No hand fitting in assembly.





TIME Study and Methods Department records of a large aviation equipment company furnish data of another job where LANDMATIC Heads have effected large savings in machine time and improvements in product quality.

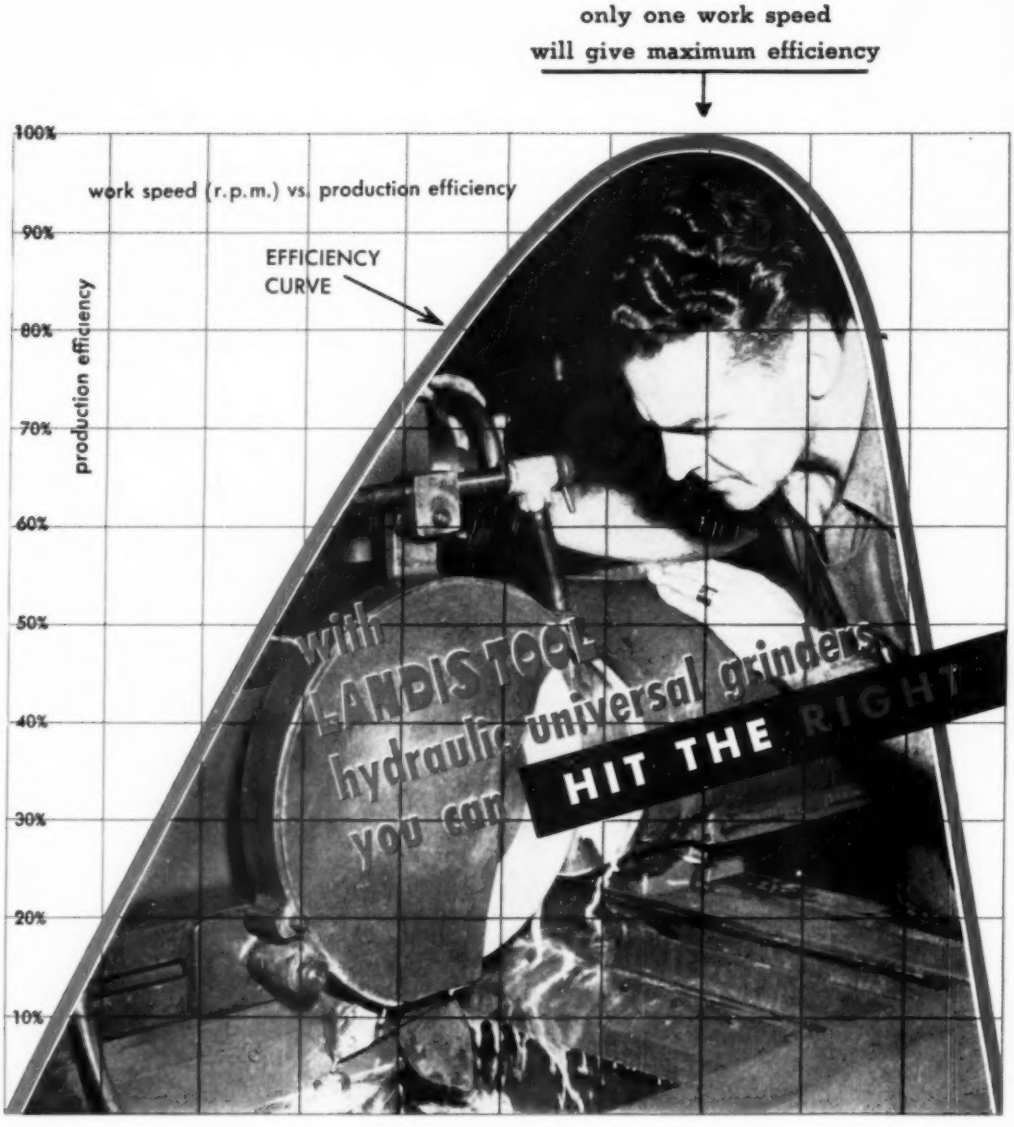
In this operation, the 1¼" LANDMATIC Head on a turret lathe equipped with Lead Screw Attachment is cutting a 5/8-6 Acme thread on a Stabilizer Screw used by a light aircraft manufacturer. The thread was held to the close tolerance of ±.001 between the P.D. of the thread and the O.D. of the screw, for a full thread length of 5-3/8" on cold-drawn piston stock, Spec. #AISI, B1112.

The thread is now cut in one pass in .192 minutes with a spindle speed of 230 R.P.M., giving an average of 400 pieces per chaser grind. This is a saving of approximately 400%. Former methods required two passes—one roughing and one finishing cut—and hand fitting with the mating nut was necessary in assembly.

LANDMATIC Heads are stationary threading heads with self-opening action designed primarily for turret lathes. Their unusually-large oversize capacity makes them ideally suited for these machines. For detailed information and specifications, write for illustrated Bulletins F-80 and F-90.

**LANDIS Machine COMPANY**

WAYNESBORO • PENNSYLVANIA • U. S. A.

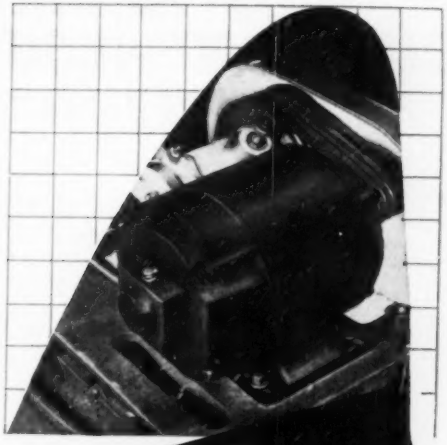



**LANDIS TOOL**
*Precision Grinders*

EQUIPPED WITH MICROSPHERE BEARINGS

No interferences from motors or belt guards when you watch grinding jobs like the one illustrated. Exclusive with LANDIS TOOL Universal Grinders.

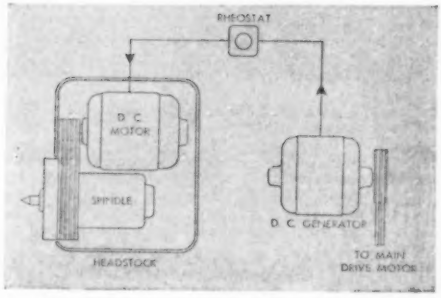
compact headstock



COMPACT HEADSTOCK with all Vee Belt drive. Electrical Speed Control gives infinite number of speeds without mechanical change. **There are only two revolving parts; the electric motor and the spindle.**

# WORK SPEED ON EVERY JOB FOR MAXIMUM PRODUCTION

how it works




You can hit the right work speed in a hurry on every job with the LANDIS TOOL series variable voltage headstock drive—an economical, simple electrical circuit. Exclusive with LANDIS TOOL.

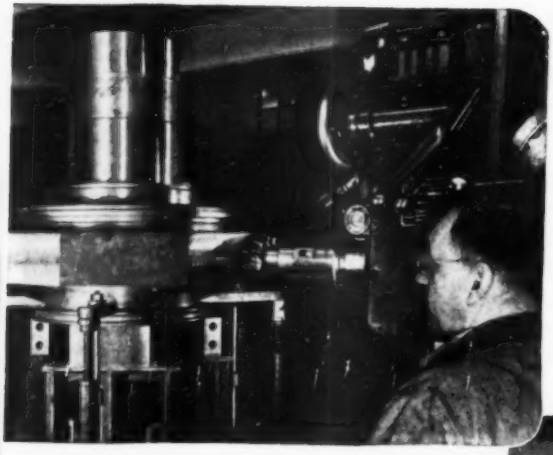
**features of LANDIS TOOL Hydraulic Universal Grinders**

1. **MICROSPHERE WHEEL SPINDLE BEARINGS**
2. **EYE LEVEL WHEEL FEED**
3. **HYDRAULIC OPERATION**
4. VARIABLE SPEED HEADSTOCK
5. **RAPID HYDRAULIC WHEEL POSITIONING**
6. **SWINGING INTERNAL FIXTURE**

LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

# HOW TO MAKE USE OF THE "BUILT-IN" ACCURACY OF YOUR G. & L. HORIZONTAL

## Accurate Bore-and-Face Relationship Obtained Automatically with a G. & L. Rotary Table



Without effort or trouble, it is possible to hold close tolerances with your G. & L. Horizontal Boring Machine equipped with a built-in rotary table.

On this job, for instance, both the milled surfaces of the octagon and bored holes are held to within ±.001" of each other. There's no need of checking and re-checking between indexes because the rotary table can be indexed to within ±.0005" using dial indicator and stops.

Perhaps you are doing jobs that could be done quicker and more accurately by using a G. & L. Rotary Indexing Table on your boring machine.

Call in one of our engineers to study your work and make recommendations. There is no obligation.

**1st SETTING**

Part is mounted on the rotary indexing table as shown.

***1st Operation***
ROUGH MILL FACES OF OCTAGON. Rotary table is indexed 45° between operations.

***2nd Operation***
Finish mill the faces.

***3rd Operation***
Drill 1¾" diameter.
Drill 1 15/16" diameter for elongated slot. (*See view at right.*)
Drill 2½" diameter—two passes.
First Pass—1⅝" drill.
Second Pass—2⅜" drill.
Rough bore 3 23/32" diameter.
(Repeat these operations for each face of the octagon.)

***4th Operation***
Finish bore 1.750", 2.500" and 3.781" diameters.

***5th Operation***
Finish bore and ream 1" diameter in elongated slot.
End mill to elongate slot.

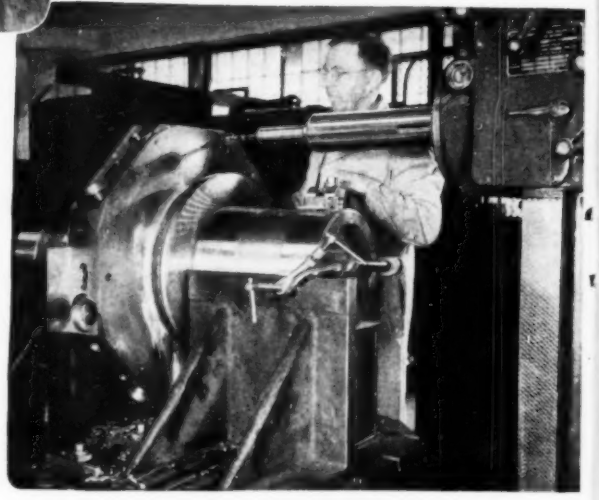
***6th Operation***
End mill 15" radius on top and bottom of corners of octagon section. (*See view at right.*)

**2nd SETTING**

The part is turned 90°, mounted on blocks and clamped to the angle plate.

***7th Operation***
Drill ¾" diameter.
Ream to .750".
Move table for operation No. 8.

***8th Operation***
Drill for ½"-13 tap—hand fed, to permit retraction of the drill to clear chips and tap.
(Repeat these operations for every face of the octagon.)

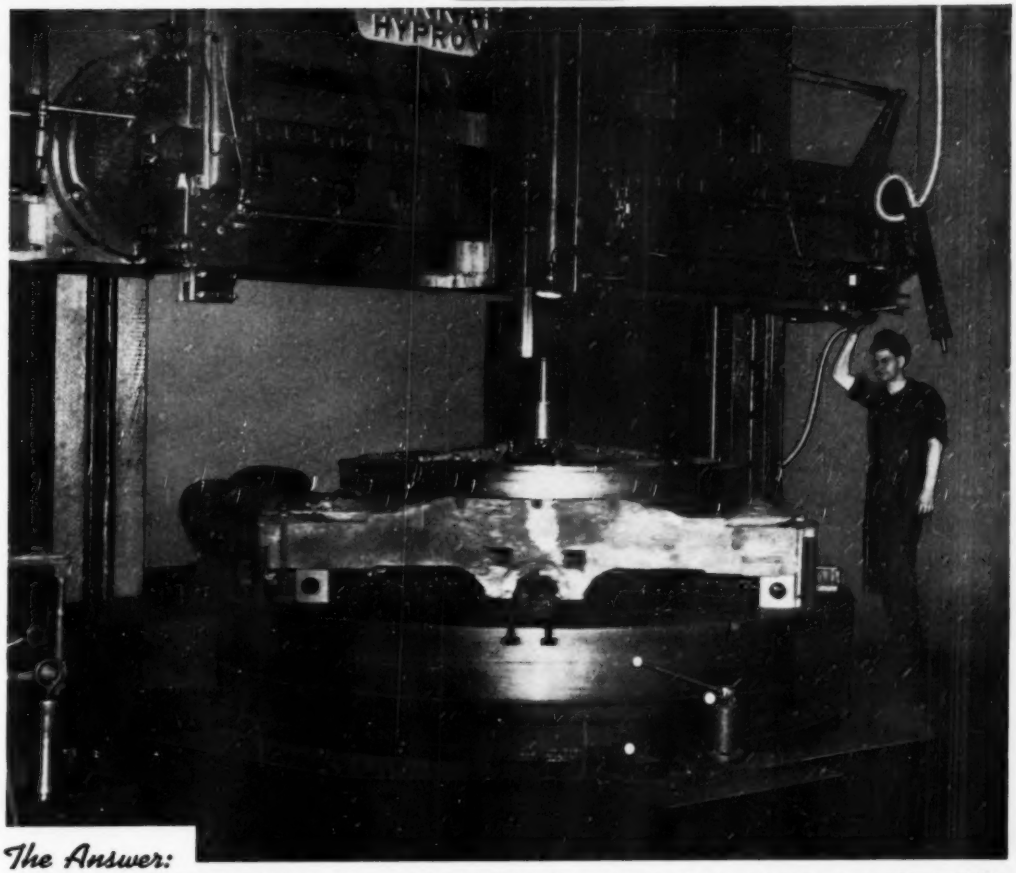


## *Additional Data*

...covering the complete line of Giddings & Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. TE44.

**GIDDINGS & LEWIS MACHINE TOOL COMPANY**
FOND DU LAC, WISCONSIN, U. S. A.

# *Why* PROGRESSIVE MANUFACTURERS USE CINCINNATI HYPRO BORING MILLS




*The Answer:*

## 28½% REDUCTION IN MACHINING TIME ON JOBS LIKE THIS

Four hours were cut from the machining time previously required to bore, turn and face this shovel truck frame trunnion and to turn the outer bearing face shown. This saving in production time is typical where large jobs are machined on Cincinnati Hypro Vertical Boring and Turning Mills.

Using two heads on the rail independently or simultaneously enables the machine operator to quickly and easily present the cutting tools to the work. This flexibility results in increased production by reducing floor-to-floor time.

**Machine Has Ample Capacity for Wider Range of Work**

Large and unusual work can be readily handled on this 12' Cincinnati Hypro Vertical Boring Mill. The machine has a maximum swing of 151" between columns and 86" clearance under the rail. Ram and bar travel 76". This wide work range may be the capacity you need to solve your large turning, boring and facing problems. Cincinnati Planer engineers will be glad to assist you in establishing advanced machining methods. Send an outline of your problems now for their profit-producing recommendations.

Write for Bulletin No. 177

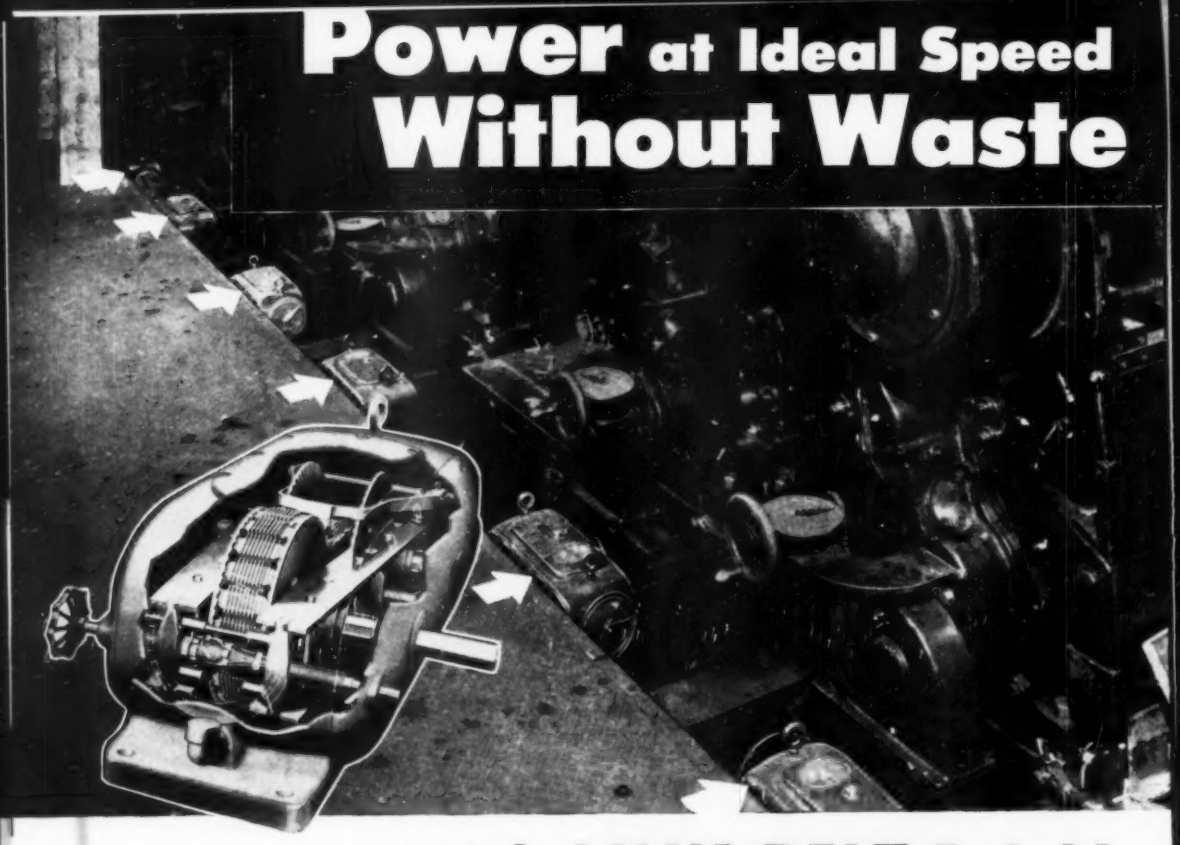
**THE CINCINNATI PLANER COMPANY**

(SUBSIDIARY OF GIDDINGS AND LEWIS MACHINE TOOL COMPANY)

CINCINNATI 9, OHIO, U. S. A.

HYPRO

# Power at Ideal Speed Without Waste



Six arrows point to six Link-Belt H-1 P.I.V. Variable Speed Drives with mechanical remote handwheel control, on black printing units of new Wood newspaper press.

## with LINK-BELT P. I. V. VARIABLE SPEED DRIVE

Link-Belt P.I.V. Variable Speed Drive is available in vertical or horizontal housings, with or without extra reduction gears, and motor, or without housing, for built-in purposes.

Supplied in eight types, up to 25 h.p., fully described in Data Book 1874-B. Send for your copy *NOW!*

You can run any machine at its ideal speed for maximum production by using the Link-Belt P.I.V. Variable Speed Drive.

This unique device furnishes positive power transmission through a chain which automatically forms its own teeth, assuring transmission of every r.p.m. without the possibility of slip or wasted power.

Output speed is instantly variable while the machine is running, and speed ratios are infinite, without steps. Once adjusted, the speed ratio remains constant indefinitely—until changed by means of the convenient hand wheel.

**LINK-BELT COMPANY**

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. 11.609

# LINK-BELT

THE SYMBOL OF QUALITY — LB — LINK-BELT

**Power Transmission Machinery**

"THE COMPLETE LINE"

TYPES OF LINK-BELT POWER TRANSMISSION MACHINERY

| | |
|---|---|
| Precision Steel Roller Chain | P.I.V. Variable Speed Drives |
| Silverstreak Silent Chain | Fluid Drives |
| Steel and Malleable Chain | V-Belt Drives |
| Worm Gear Drives | Ball Bearings |
| Herringbone Gear [illegible]es | Roller Bearings |
| Helical Gear Drives | Babbitted Bearings |
| Gearmotors | Couplings, Clutches, Collars, etc. |

# "Are you telling Me that I don't know how to Count?"

*—exploded the chief engineer*

NO *SIR*, chief—not *you!* Only meant to suggest that your swell new machine might do itself much prouder, saleswise, if it only—so to speak—could "learn to count." That's all.

*But that's a lot!* Many machines that have been "taught to count"... with a Veeder-Root Counter built-in as original equipment... have shown some startling sales-spurts. For this unique feature gives any product a new usefulness, a new sales appeal, a new distinction from competition. And there *are* golden probabilities that *your own product* has hidden talents in functional service which a built-in Veeder-Root Counter can build up into something big. Such talents may hide themselves from you ... but not from the creative, mathematical eye of a Counting House engineer. He'll be glad to take a look, any time you say.

**NEW GENERAL-PURPOSE COUNTER** is modern, streamlined, compact... fits readily into most design-limits. Attractive to look at, easy to read. Send for 8-page Condensed Catalog and complete spec-sheet on this counter, No. 1260. Write to

**Veeder-Root** **COUNTERS**

VEEDER-ROOT INC., HARTFORD 2, CONNECTICUT

*In Canada:* Veeder-Root of Canada, Ltd., 955 St. James Street, Montreal 3. *In Great Britain:* Veeder-Root Ltd., Kilspindie Road, Dundee, Scotland.

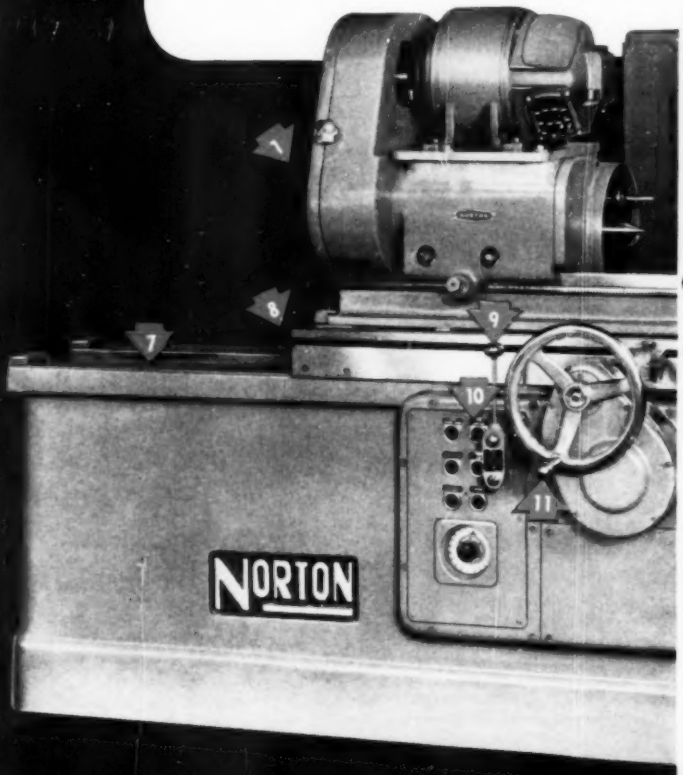
# Look at these COST-CUTTING

## New NORTON Type CTU

1. Close-Approach Rear Base Design
2. Stand-Up Electrical Controls Mounting
3. Swing-Back Wheel Guard Cover
4. Mist-Control Hinged Hood
5. Easy-Swing Nozzle Mount
6. The Famous NORTON Wheel Spindle Unit
7. Space-Saver Ribbon Type Base Way Guards
8. Quick-Clean Coolant Ramp
9. Feather-Touch Work Jogging Lever
10. Finger-Tip Automatic or Manual Work Rotation Selector
11. Silky-Sure Hand Table Traverse
12. Quick-Action Pre-Set Truing and Grinding Speed Control
13. Either-End Table Dwell Control
14. No-Search "Click-Count" Wheel Feed Mechanism
15. "One-Lever" Grinding Cycle Control for Semi-automatics
16. Instant-Action Automatic Feed Rate Controls
17. Knee-High Hydraulic and Lubricating Pump Mounting

## . . . Compare Them With

HERE are 17 of the many reasons why you'll like the new Norton CTU—in the popular 6" size for your smaller jobs, in the 10" size for larger work—11 features that contribute to new ease of operation, 6 features that give new ease of maintenance.

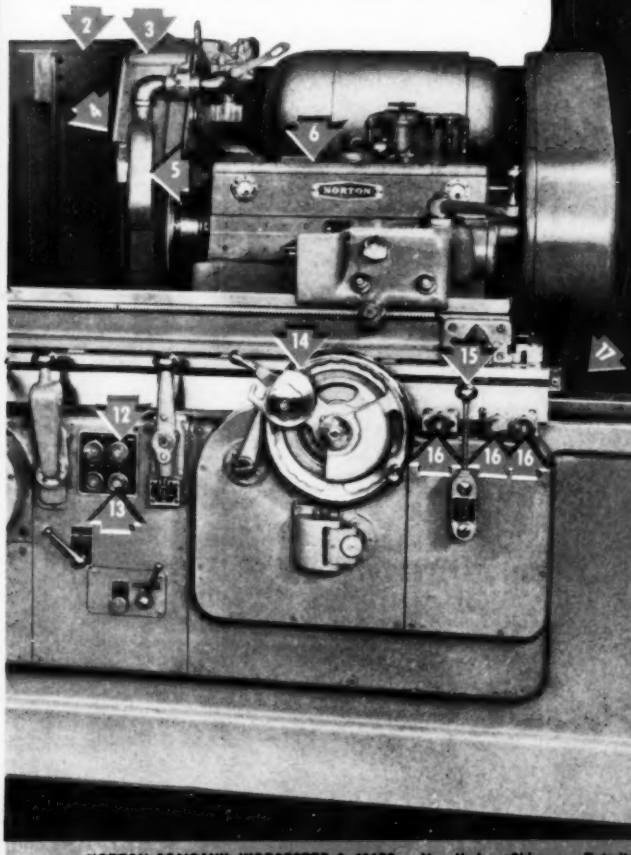



Abrasives · Grinding Wheels · Grinding and Lapping Machines · Refractories · Porous Medium · Non-slip Floors · Norbide Products · Labeling Machines

# FEATURES *of the*
## *Cylindrical Grinders*

### *Your Present Equipment*

Compare these production, design and maintenance features with your present equipment. You'll see why savings of 20 to 30% are being reported in plant after plant with the new Norton CTU—the grinder with the exclusive Norton Wheel Spindle Unit.




### *NEW FEATURES NEW CATALOGS*

The outstanding features of these new Norton Grinders are graphically illustrated and described in a new series of catalogs. Write for any or all—no obligation.

Catalog 157-2—Norton 6″ Type CTU Cylindrical Grinders

Catalog 1488-1—Norton 6″ Type CTU Semiautomatic Cylindrical Grinders

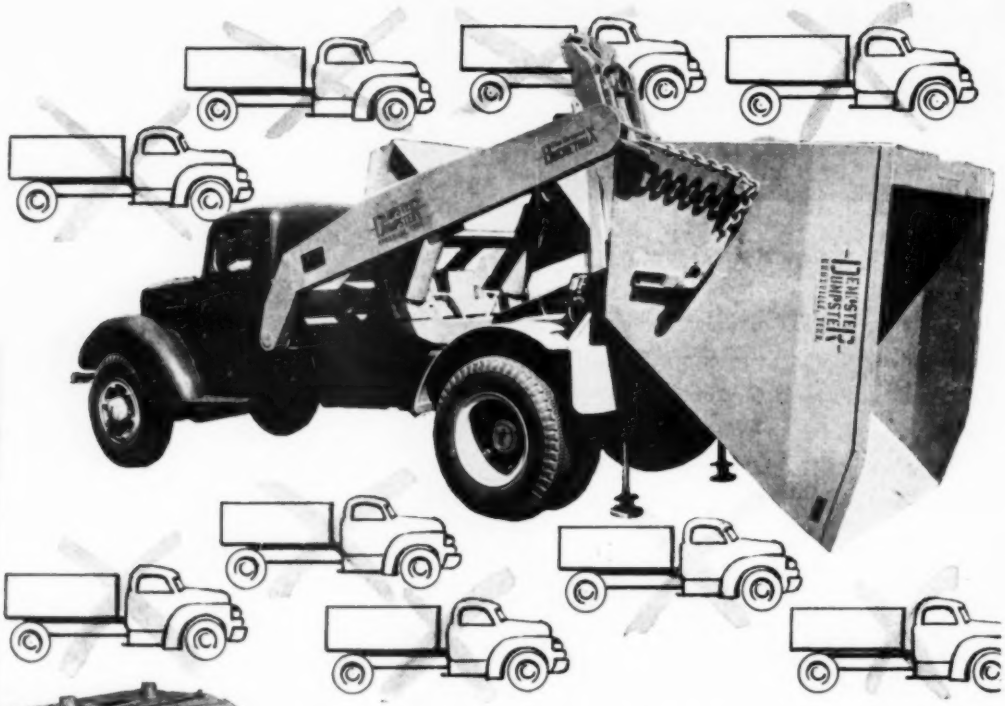
Catalog 166-2—Norton 10″ Type CTU Cylindrical Grinders

Catalog 1787-1—Norton 10″ Type CTU Semiautomatic Cylindrical Grinders

NORTON GRINDERS and LAPPERS

M-578

NORTON COMPANY, WORCESTER 6, MASS. - New York - Chicago - Detroit - Cleveland - Hartford - Distributors in 48 Principal Cities



# WOULD YOU WRITE A LETTER FOR FIFTY THOUSAND DOLLARS?

A simple reply to one of our advertisements . . . a meeting of probing minds over the problems involved . . . the replacing of ten conventional trucks with only one Dempster-Dumpster truck unit and 99 containers . . . fifty thousand dollars annual savings for this one firm.

That, briefly, was the result of a simple inquiry for information about the Dempster-Dumpster System of materials handling.

A comprehensive Dempster-Dumpster survey revealed costly delays, unnecessary handling of materials, and much time wasted by loading crews. All were eliminated to the tune of $50,000 savings annually. Fast pick-up, hauling and dumping of pre-loaded Dempster-Dumpster containers replaced the old method of plant hauling. Ninety-nine detachable containers, built in over 20 sizes and designs for the specific materials they handle, were spotted at material accumulation points. Some are handled by fork trucks, others by overhead cranes within plant buildings. As containers are filled, the Dempster-Dumpster truck hoisting unit and one man, the driver, picks up each container, hauls it to its destination, dumps it and returns the empty container for refilling.

Pick-up and dumping of these detachable containers takes less than 60 seconds. The entire operation works to an on-the-run schedule. One truck hoisting unit handling 99 containers and doing the work formerly requiring ten conventional trucks. Let us bring you the complete details of the Dempster-Dumpster System.

Containers, in standard and special types, in capacities from 1½ to 10 cu. yds. are available. Whatever your materials are, be they heavy, light, bulky, dust, liquid, waste, raw or finished, you'll find a Dempster-Dumpster container ready, or custom built, to do the job more efficiently.

DEMPSTER DUMPSTER
TRADE MARK REG.
SYSTEM

**DEMPSTER BROTHERS, INC., 4119 DEMPSTER BUILDING, KNOXVILLE 17, TENNESSEE**

# Hardened Tool Steel Vees

**60 ROCKWELL C**

**protect the carriage ways of**

**"AMERICAN" PACEMAKER LATHES**

They are standard equipment on all "AMERICAN" Lathes

These hardened vees are made of solid tool steel and ground to gauge tolerances for interchangeability should replacement ever be required.

After hardening, the metallurgical structure is stabilized by cold treatment at minus 108° Fahrenheit to prevent twisting or warping.

This feature is but one of the outstanding advantages offered by the new "AMERICAN" Pacemaker Lathe.

Bulletin No. 16 gives the complete story—want one?

**THE AMERICAN TOOL WORKS CO.** **Cincinnati, Ohio U.S.A.**

LATHES AND RADIAL DRILLS

# INCREASE PERCENTAGE OF GRINDING TIME

## with these

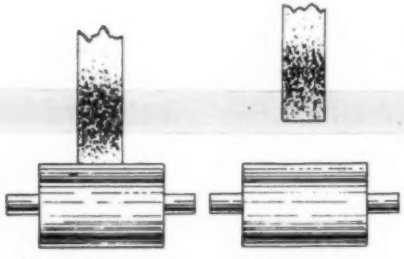
## 2 ADVANCE-DESIGN AUTOMATIC CYCLE ARRANGEMENTS

THE NEW Automatic Cycle and Spark-Timing Arrangement and the new Automatic Cycle and Sizing Arrangement make Brown & Sharpe Plain Grinding Machines even more productive and versatile. They assure extremely-rapid uniformity of sizing and finish, practically full-time grinding, a minimum of rejects . . . with less effort and attention from the operator.

A UNIQUE FEATURE common to both Arrangements is the *direct-contact wheel-to-work manual infeed* at the start of the cycle. This feature permits larger work tolerances in preceding operations. It eliminates the need of set-ups that favor the high limit of previous turning tolerances. Non-productive time is out . . . no "air-cutting" —net result, appreciably lower overall machining cost.

ANOTHER IMPORTANT FEATURE common to both arrangements is *ease of disengagement*, whereby the machines are instantly available as standard plain grinding machines.

Investigate these new opportunities to reduce your grinding costs still further. Highlights of each arrangement given on opposite page. Arrangements available on all Brown and Sharpe Plain Grinding Machines. Write for complete details. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

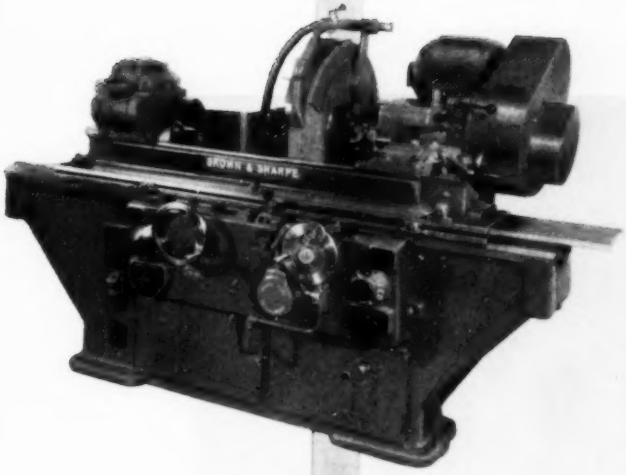


1. Immediate contact with work.

2. "Air cutting" on conventional machines with automatic cycle.

These two diagrams show the advantage of Brown & Sharpe infeed over conventional automatic cycle infeeds. **1.** Brown & Sharpe infeed brings grinding wheel into immediate contact with work by a continuous smooth sweep of handwheel . . . provides initial grind before cross-feed pawl is engaged. **2.** With conventional infeed, wheel must approach work on slow feed.

BROWN &




No. 22 Plain Grinding Machine with Automatic Cycle and Spark-Timing Arrangement.

No. 10 Plain Grinding Machine with Automatic Cycle and Sizing Arrangement.

## AUTOMATIC CYCLE AND SPARK-TIMING ARRANGEMENT

On plunge-cut or transverse grinding where uniformity of sizing and finish is essential, this arrangement automatically controls spark time and operation at a predetermined rate (spark time adjustable from 2 to 180 seconds). After grinding is completed, wheel slide withdraws automatically, headstock stops and coolant is shut off. Arrangement used with reciprocating table employs normal amount of spark time allowed for traverse grinding without automatic cycle. Handwheel operation provides positive protection against automatic cycle starting accidentally.

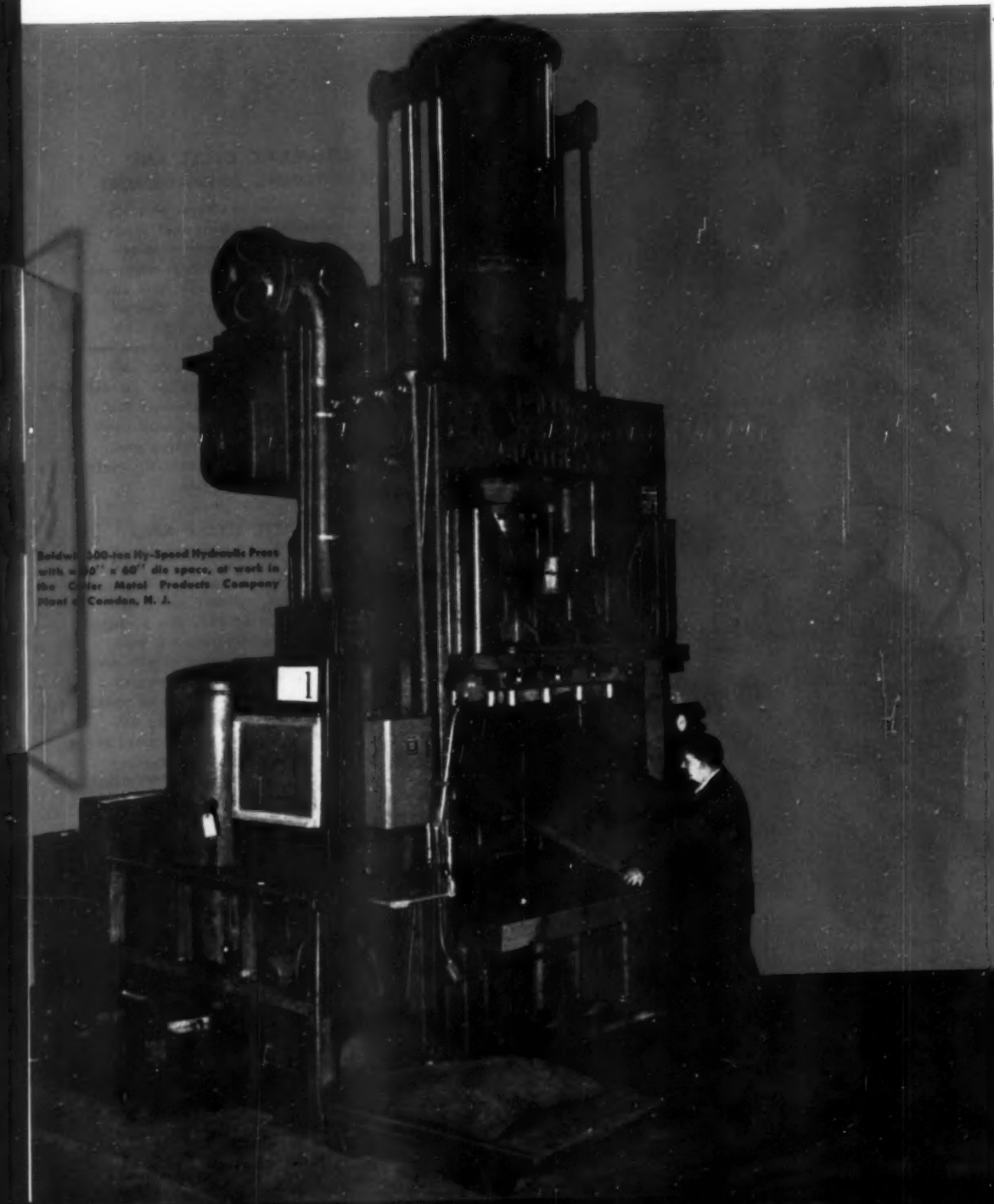
## AUTOMATIC CYCLE AND SIZING ARRANGEMENT

For longer production runs on plunge-cut grinding, where uniform sizing and finish to .0001″ are desired, this arrangement offers maximum output at minimum cost and effort. It automatically sizes from the work—eliminates compensating for wheel wear and effects of wheel truing. After loading and three simple hand operations, cycle is completed automatically. When wheel approaches within .001″ to .003″ (pre-set on work sizing gage) of finish size, cycle changes from coarse feed to predetermined fine feed.

THESE TWO NEW ARRANGEMENTS NOW AVAILABLE on the following Brown & Sharpe Plain Grinding Machines: No. 5—Nos. 10 & 12—Nos. 20, 22 & 23.

SHARPE B·S

# at CUTLER METAL



Baldwin 600-ton Hy-Speed Hydraulic Press with a 50" x 60" die space, at work in the Cutler Metal Products Company Plant at Camden, N. J.

# PRODUCTS COMPANY

## this Baldwin "exceeds expectations!"

An important producer of all types of industrial sheet-metal and fabricating work on both short-run and high production schedules, the Cutler Metal Products Company regards its Baldwin 300-ton Hy-speed Hydraulic Press as "one of the finest pieces of equipment in the plant". Since the facilities include a complete tool and die shop, welding equipment of all types including automatic arc, shearing and braking facilities to handle plates up to 12′ wide x ⅜″ thick, and press equipment ranging from 10-ton units up, all modern and efficient, this tribute to the Baldwin press is particularly impressive and significant.

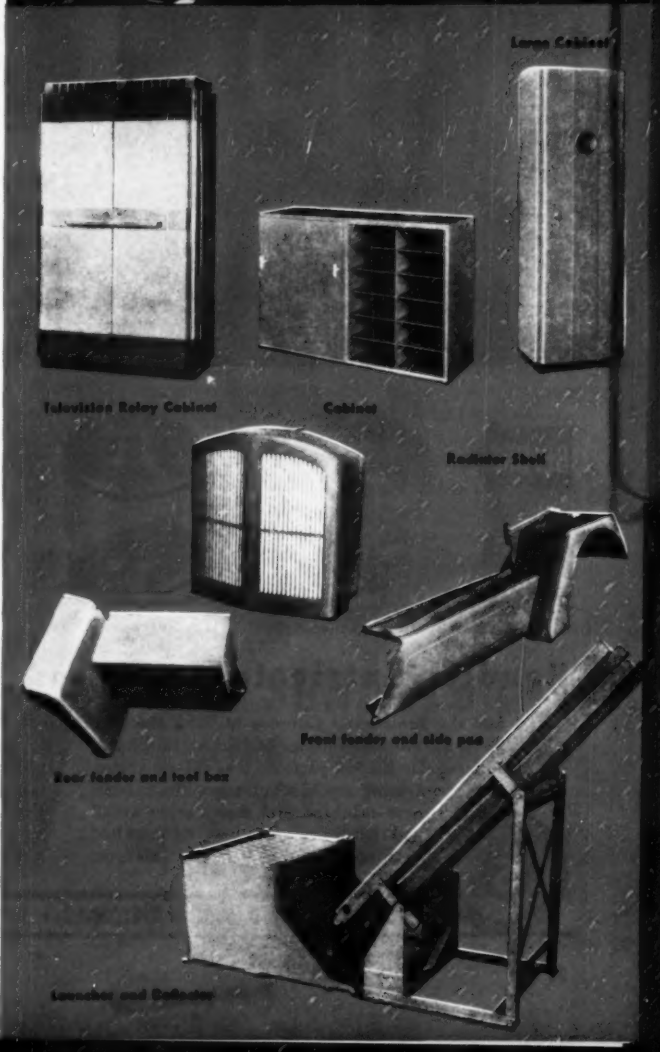
Some of the many products which the Baldwin Press helps to produce at top speed and rock-bottom cost are illustrated at right.

Mr. Abraham Z. Cutler, vice president, stated that the Baldwin unit had "more than lived up to expectations, and completely justified every claim". In reviewing the features of the press, he pointed out the following as making vital contributions to the sustained production records established by the unit.

1. *Controlled pressure* on the work, based on the resistance of any one point.
2. Die interchangeability, because of the absence of a fixed working stroke.
3. Complete control of the slide at every portion of working and return stroke, insuring a more uniform product.
4. The small number of moving parts and the straight-line motion of the ram, free from heavy side thrusts. This helps to hold maintenance to a minimum.

Cutler is just one of a number of progressive metal working organizations that have found the key to better, faster, more profitable production in a Baldwin Hydraulic Press. Ask for Bulletin 160—and ask, also, for a representative to call and discuss your press requirements with you.

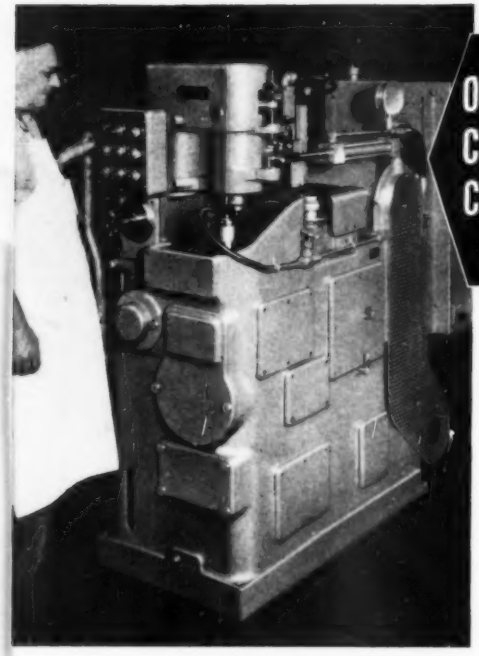
The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A. Offices: Boston, Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, St. Louis, Washington. In Canada: Baldwin Locomotive Works of Canada, Ltd., Toronto, Ontario.




**BALDWIN** THE BALDWIN GROUP

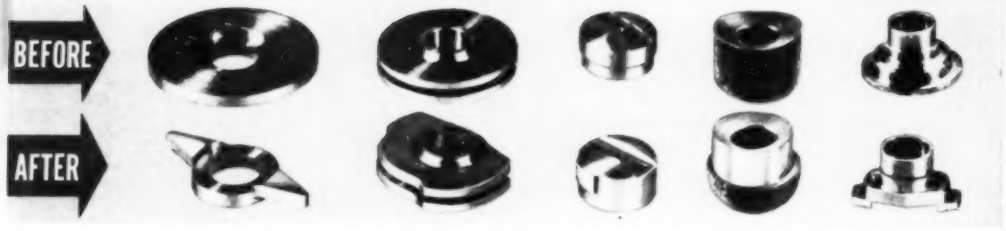
**HYDRAULIC PRESSES**

# Milling Time Cut From 6 Minutes to 39 Seconds



**ON THIS SUNDSTRAND CAM-CONTROLLED CONTOUR MILLING MACHINE**

The operation of milling the Geneva cam on one end of the small gear part shown above is another typical time-saving application of the Sundstrand Contour Milling Machine shown at left. Approximately 3/32″ stock is removed. Previous time was six minutes. With the Sundstrand Contour Milling Machine, time has been reduced to 39 seconds.

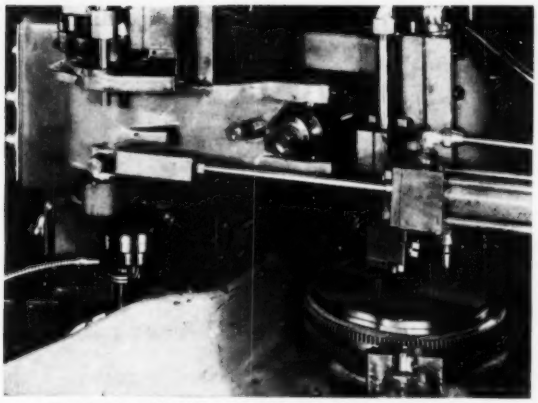



## Handles Intricate Parts and Operations Like These

You'll find the Sundstrand Contour Milling Machine adaptable to a countless number of cam milling operations on irregular shaped parts such as shown above. Sewing machine, gun, governor, business machine and many other small and intricate parts can be handled profitably on this versatile machine.

Machine adjustments can be quickly and easily made for over 24 different cycle combinations. It handles parts 5″ in diameter or less. Even if your work runs into larger sizes, check with Sundstrand "Engineered Production" Service, as larger standard machines or an entirely special machine may be the most economical solution to your problem.

**RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT**



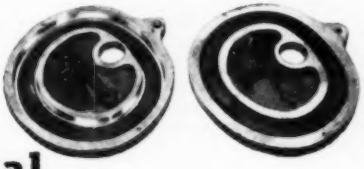
Work holding table and cutter spindle at left. Cam and cam follower at right. Note connecting arm between cam follower and cutter spindle.

## Mills Master Cams

You will save many hours of engineering intricate cam profiles with this machine. Through the substitution of a cam-cutting spindle to replace the cam roller spindle, the machine operating procedure can be reversed to produce cams by merely following the sample part which is clamped in the fixture on the machine table.

## Simple to Operate

In spite of the complex work performed by this machine, it is amazingly simple to operate. It is completely automatic, yet easy to set up for the different jobs. This simplicity of operation makes it possible for one man to attend several machines without sacrifice of accuracy or production.



## Mills Both External and Internal Cams

Both internal (above) and external contours (opposite page) can be milled quickly and accurately on this single vertical spindle cam-controlled Contour Milling Machine. Its vertical cutter spindle and the cam follower spindle are mounted together on a pivoting arm in a 2 to 1 ratio, which reduces any cam error 1/2 on the finished part. The 3/4 HP adjustable speed spindle motor has ample power and speed range for the size of work for which the machine is intended. The 6″ diameter rotary table and cam-carrying spindle are both driven from the same motor, with feed rotation variable from .2 rpm to 5 rpm.

## Sundstrand Engineered Production Service

Sundstrand engineers are available to study and recommend the most effective application of Sundstrand machines to your particular problem. These engineers have had the wide experience in milling and turning which enables them to design most effective tooling and make standard and special attachments for Sundstrand machines which will increase production and lower costs.

Engineered Production Service recommendations are available without obligation. Use this service freely. Just send complete and accurate information on your requirements with each inquiry.

## FREE ADDITIONAL DATA

This 6-page folder contains complete information and specifications of this production contour milling machine. More detailed description covering the 24 automatic cycles and how easily they can be set-up to handle the milling of a variety of contours is included. It's FREE. Ask for Bulletin No. 190.

**SUNDSTRAND**
**MACHINE TOOL COMPANY**
**2533 Eleventh St. • Rockford, Ill., U.S.A.**

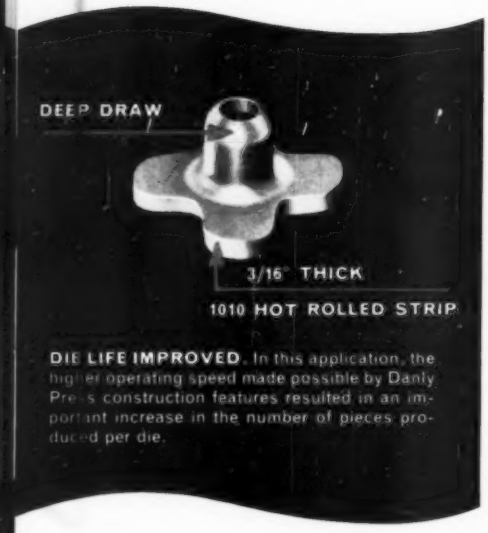
**DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES**

# NEARLY 600,000 PIECES

**...a new production record made possible by higher press operating speeds**

Deep drawing heavy gage coil stock at high speeds on progressive dies is a real test for a press. In this operation, like the one shown, a Danly Autofeed is achieving shift production running close to 4000 units in spite of time required for restocking and die changing.

And in the matter of die life, this production average speaks for itself. Precision closure and extra rigidity built into this Danly Autofeed assure longer runs before die sharpening is required.




**DIE LIFE IMPROVED.** In this application, the higher operating speed made possible by Danly Press construction features resulted in an important increase in the number of pieces produced per die.

## Danly Presses Run Longer

Records like this are made possible by exclusive mechanical features found only in Danly Presses. First, there is the new Danly cool-running clutch, designed to outwear conventional press clutches because less destructive heat is generated. And a special forced air cooling system keeps the clutch operating temperature only 35° above room temperature. Other advantages include positive pressure lubrication throughout and sensitive control reaction to facilitate die try outs.

**CHECK THESE**
**EXCLUSIVE DANLY PRESS FEATURES**

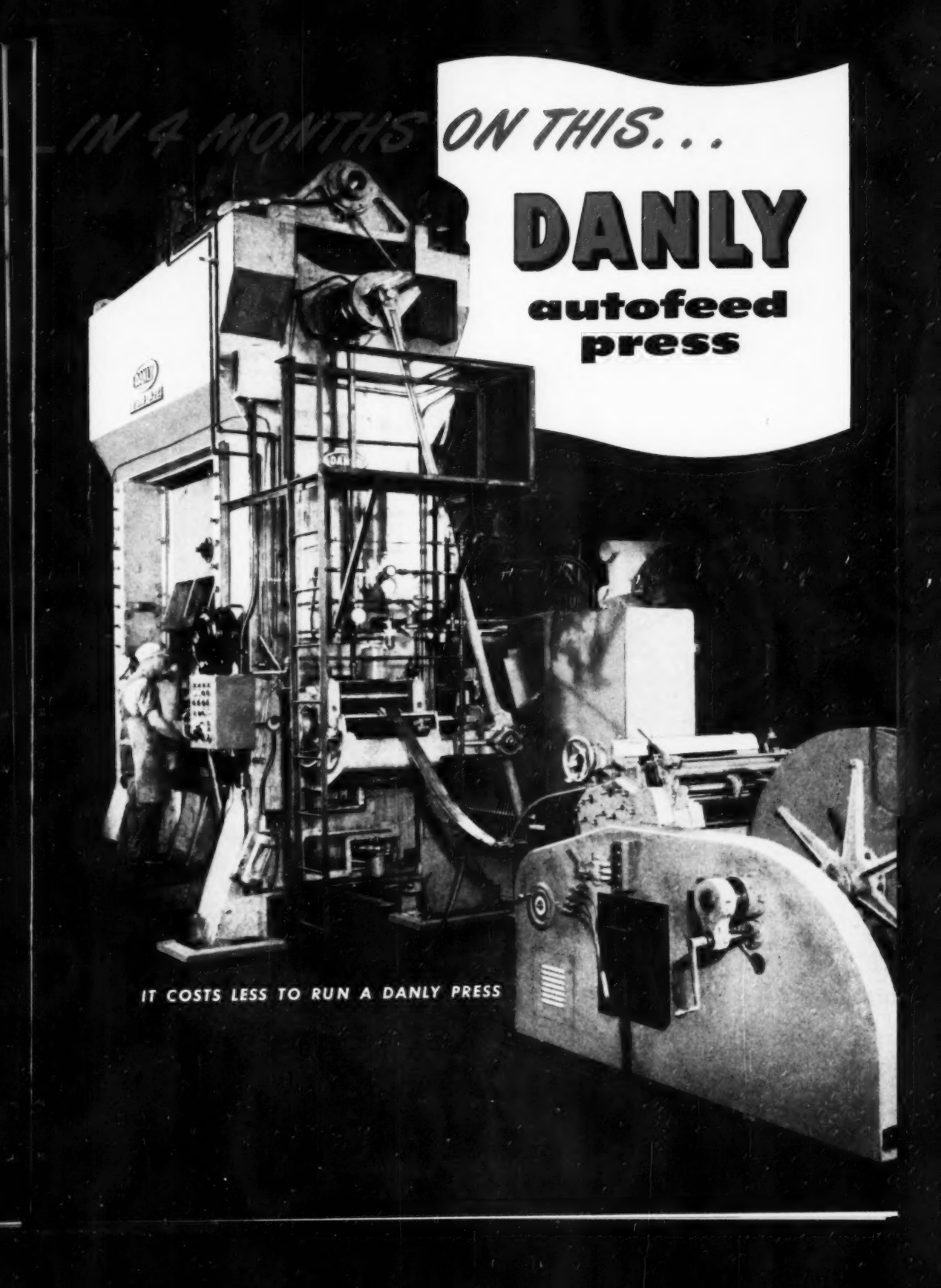
- ✓ cool-running clutch
- ✓ extra rigidity
- ✓ complete pressure lubrication
- ✓ special controls—sensitive reaction
- ✓ precision construction

***SEND FOR THIS FREE BOOKLET...***
*and see for yourself how DANLY AUTOFEED presses offer the advantages of automatic feeding over a greatly expanded range...50 to 800 tons.*

MECHANICAL PRESSES...50 TO 3000 TONS

**DANLY**

**DANLY MACHINE SPECIALTIES, INC.**
**2100 South 52nd Avenue, Chicago 50, Illinois**


IN 4 MONTHS ON THIS...
DANLY
autofeed
press
IT COSTS LESS TO RUN A DANLY PRESS

# A NEW WAY TO

*From flat stock to* → **Vulcan-draw** = *one corner formed*

Vulcan
Designs and Builds
Dies
Tools
Machines
Fixtures
Equipment

*Rotate the sheet forming one corner at a time . . . overall specified dimensions are held . . .*

# Vulcan-draw

**GUARANTEED! WE'RE TOOL AND DIE BUILDERS SINCE 1916.**

# CUT PANEL COSTS

***For medium production schedules you draw one corner at a time...eliminate costly draw dies...eliminate costly notching, hand welding, and finishing...Use simple corner punch and die for all sizes with the same corner radius...switch in a few minutes to a similar die for a corner of different radius.***

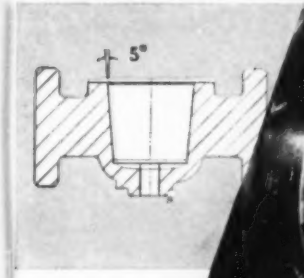
You further cut costs by releasing punch press equipment for other work. Most any radii and any panel size from 15" x 18" up to the largest panel can be handled in the Vulcan-draw . . . A pedal starts a few-seconds hydraulic cycle producing a corner completely drawn and finish sized . . . Rotate the sheet and you get all corners with overall panel dimensions held . . . Former cost per corner and per finished panel is cut to fractions depending on the number and variety of short or medium run jobs to be done.

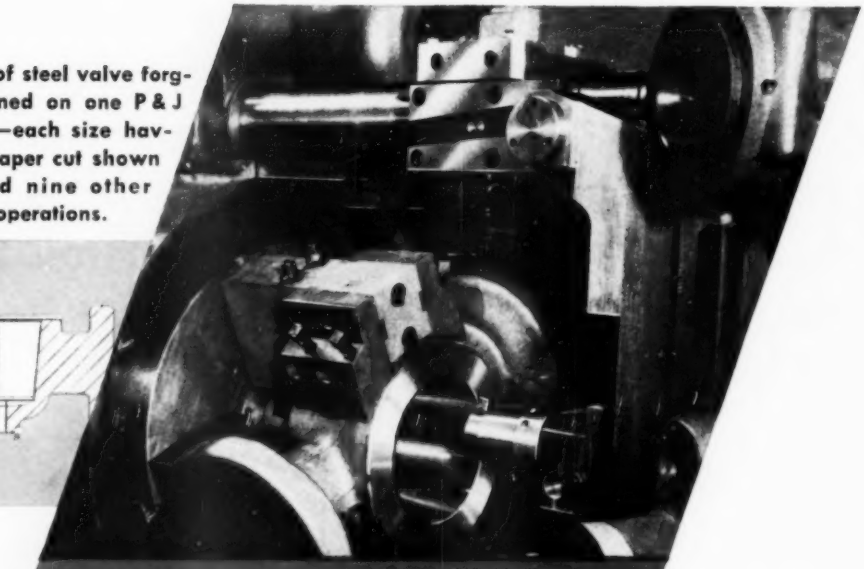
We will gladly forward additional information if your request includes your present panel part prints for our immediate proposal or recommendation. This will cover the Vulcan-draw, the corner dies, and all needed brake press, corner trim, and return flange dies to make fully finished panels at reduced cost. Present Vulcan-draw deliveries approximately 16 weeks.

**VULCAN TOOL CO., 730 LORAIN AVE., DAYTON 10, OHIO**

# *Sizable job...* and the Tooling that does it...

**Four sizes of steel valve forgings machined on one P & J Automatic—each size having the 5° taper cut shown below, and nine other close-limit operations.**



## on the P&J AUTOMATIC

POTTER & JOHNSTON'S tool engineers generally take difficult tooling problems in stride, but this one was a challenge. First of all, the job was big — four different sizes of valve forgings with a mass of steel to break down for the 5° taper, plus nine more exacting operations on each one to close accuracy limits. One master tooling setup plus three sets of chucking fixtures did the trick. P&J economy tooling licked all four jobs on one P&J 6DS Automatic Turret Lathe.

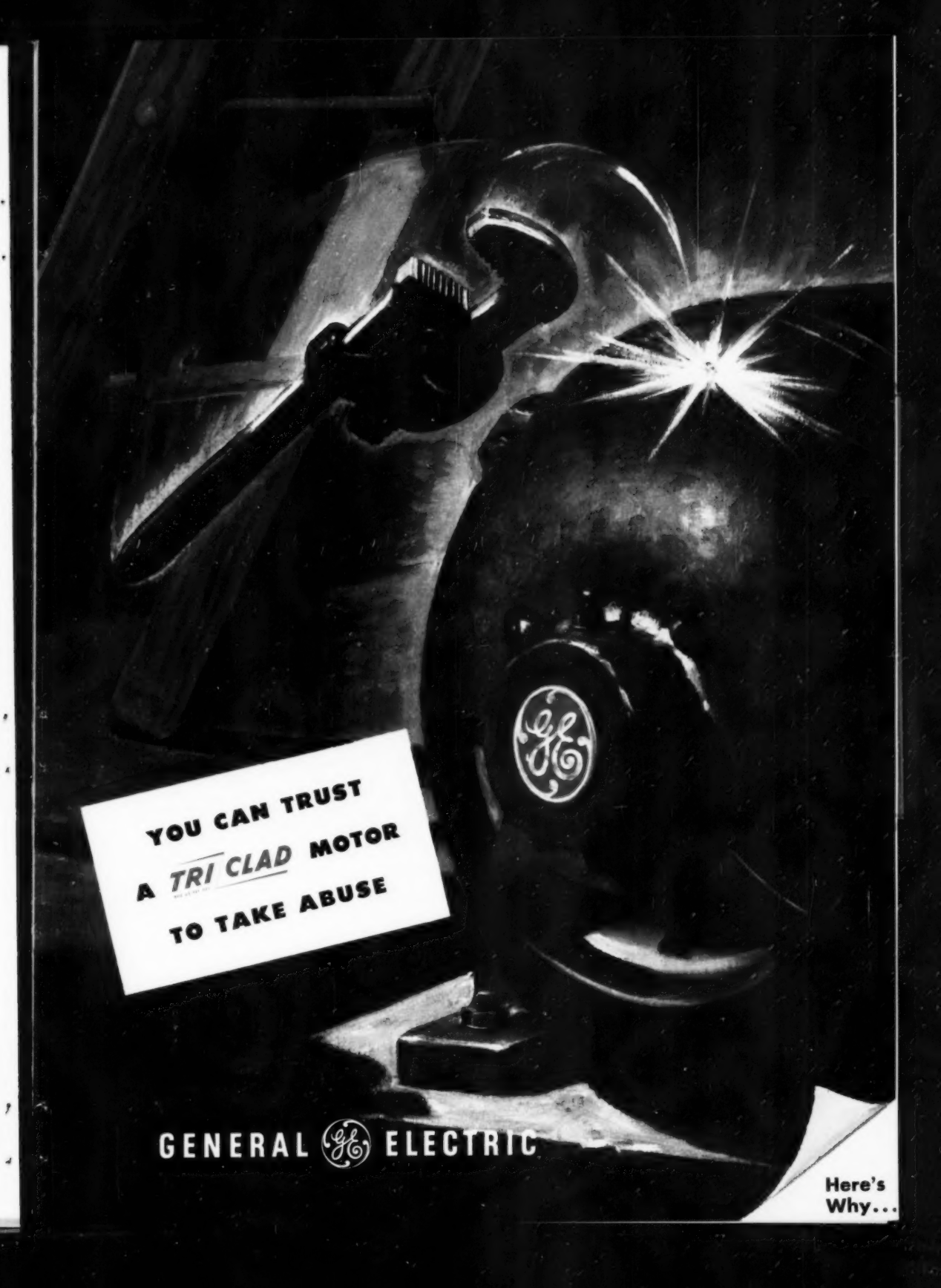
The perfection of this job can be attributed to P&J's wealth of experience to engineer a sequence of toolings with an eye toward economy. P&J Tooling is the natural team-mate for any of the versatile P&J Automatics — in this case the 6DS. It's a combination that really works, with all the economy-advantages of precision, speed and low-cost operation. We can show you dozens of examples.

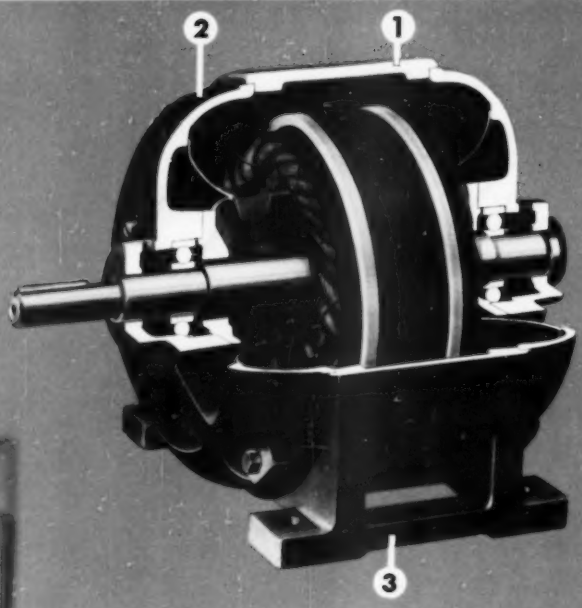
An estimate from Production Tooling Headquarters on your sample parts or prints may be the profitable answer to your quantity production problems. Write us for recommendations, and for the Catalog on the 6D series of P&J Automatics.

**Potter & Johnston Company**

Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company


YOU CAN TRUST
A TRI CLAD MOTOR
TO TAKE ABUSE
GENERAL ELECTRIC
Here's
Why...




Notice the thick cross sections of a Tri-Clad's husky cast-iron stator frame (1) and end shields (2) . . . the integrally cast feet (3). Here you have a *rigid structural unity* that no other general purpose motor we've seen can match. Distortion of bearing alignment is well nigh impossible, even by severe blows, careless installation, or the heavy continuous radial loads some industrial drives impose. Notice, too, how Tri-Clad double-end ventilation provides *uniform* "air conditioning" throughout the motor.

# You can trust a *TRI CLAD* motor to take abuse

Teeth-rattling blows – accidental jarring – dripping liquids – they're all in a day's work for a Tri-Clad motor – the toughest general-purpose motor that hard-headed plant management can buy.

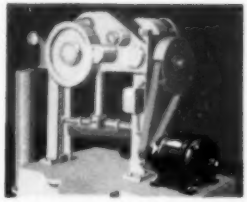
The cast iron structure which today protects more than a million and a half Tri-Clad motors, is one big reason for its stamina. It absorbs the shock of accidental blows and falling objects encountered in rigorous industrial service. It provides vastly superior resistance to rust and corrosion. Moreover, cast iron won't take on an injurious permanent "set"; thus it assures accurate shaft alignment and a permanent air-gap for the life of the motor. Thick-ribbed cast-iron end shields, too, take more than their share of punishment.

Want to standardize on a line of motors that can really **TAKE ABUSE?** Local stocks of Tri-Clad motors in your area mean **QUICK DELIVERY.** *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

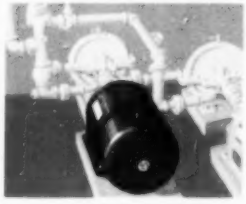
GENERAL ELECTRIC

760-11

## YOU CAN'T BEAT *TRI CLAD* EXTRA PROTECTION



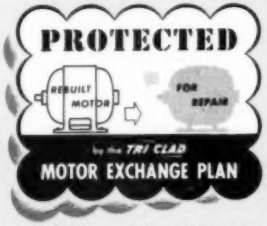
**G-E open (drippproof) induction motors** for constant-load, constant-speed applications. From 1 to 2000 hp.



**G-E totally enclosed motors** for outdoor operation, in abrasive dusts, or corrosive fumes. From 1 to 1000 hp.

**G-E vertical induction motors** for pump drive, in streamline design. From 1 to 500 hp.

**G-E capacitor motors** for use on fans, blowers, pumps and compressors, with single-phase power. From ¼ to 5 hp.




Look for this **EXTRA** on the motor you buy!

# no other end mill will outperform a UNION

## contact your local distributor

*His name is listed in Union's THOMAS' REGISTER insert under the heading "Drills, Twist".*

**UNION TWIST DRILL COMPANY,** ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

# 20 pieces per hr. by former method
# 180 pieces per hr. on the BLANCHARD

Once again Blanchard Surface Grinding increases part output while slashing production costs . . . today's best formula for putting manufacturers in the black.

This time a Blanchard No. 18 with a magnetic chuck was used. A special circular fixture, of laminated construction for magnetic purposes, with 59 spring-loaded locating V's around its outer circumference was designed to hold the work. The unique design of the fixture provided for precise locating, aligning and holding of the fine grain cast iron connecting rods which had to be ground flat and at right angles to the pins — accurate finishing being essential to a later hollow milling operation of the pins.

The combination of the Blanchard's ability to remove stock more rapidly to exact tolerances and the clever holding fixture stepped up production to 180 pieces per hour as against 20 per hour by best other production method.

Here are the part details:

Length of base overall 7¼", width of base—⅞", thickness of base before grinding—7/16", overall length of pins—1¾", rough diameter of pins—⅞", finished diameter of pins—¾". Material removed 1/16" on major portion of base and two cross lugs 1/16" additional.

Send for your free copies of "Work Done on the Blanchard", third edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

**THE BLANCHARD MACHINE COMPANY** 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

## NO PLACE FOR REPLACEMENTS HERE!

. . . so the nation's biggest underwater tunnel uses Everdur† Electrical Conduit to carry traffic light and control cables. New York's Triborough Bridge and Tunnel Authority, builders of the Brooklyn-Battery Tunnel, made selection on the basis of long-time service records on comparable installations.

## WELL, WELL, WELL, WELL

That's right, four of 'em. 38" diameter slotted well screens of Everdur, built by the Layne-Northern Company of Mishawaka for Elkhart, Indiana's water supply. Reasons: strength, weldability, machinability, corrosion resistance . . . and nary a trace of rust!

# Watching EVERDUR* At Work

*REG. U. S. PAT. OFF.

## TRAFFIC CONTROLS

Down from the Alvarado Regulating Reservoir rushes the water supply for San Diego at 100-lb. pressure. Many of the vital parts of these mechanical traffic cops are made of Everdur for long operating life. These big butterfly valves, up to 42" I. D., were made by Coldwell-Wilcox Division of Krajewski-Pesant, New York.

## HAPPY THOUGHT IN A SQUALL!

When thunderheads race up and your boat lays over on her beam's end — you pray everything will hang together. That's the time to be thankful for your boat builder's judgment in using strong, tough, non-rust Everdur fastenings

. . . and speaking of seagoing metals, the Design Engineering Company of South Pasadena, California, developed this marine shell block of Everdur. Maximum strength and minimum weight are combined in this one-piece, folded-and-drawn, rivetless block construction. 49190

## "DID YOU KNOW" DEPARTMENT

Maybe it never occurred to you that many belt-drive applications require a non-magnetic, spark-resistant lacing. Well, they do. And the Flexible Steel Lacing Company of Chicago makes 'em under the trade name "Alligator." Out of Everdur, of course.

## P.S. HOW ABOUT SENDING IN YOUR STORY ON EVERDUR?

## WHAT'S YOUR METAL PROBLEM?

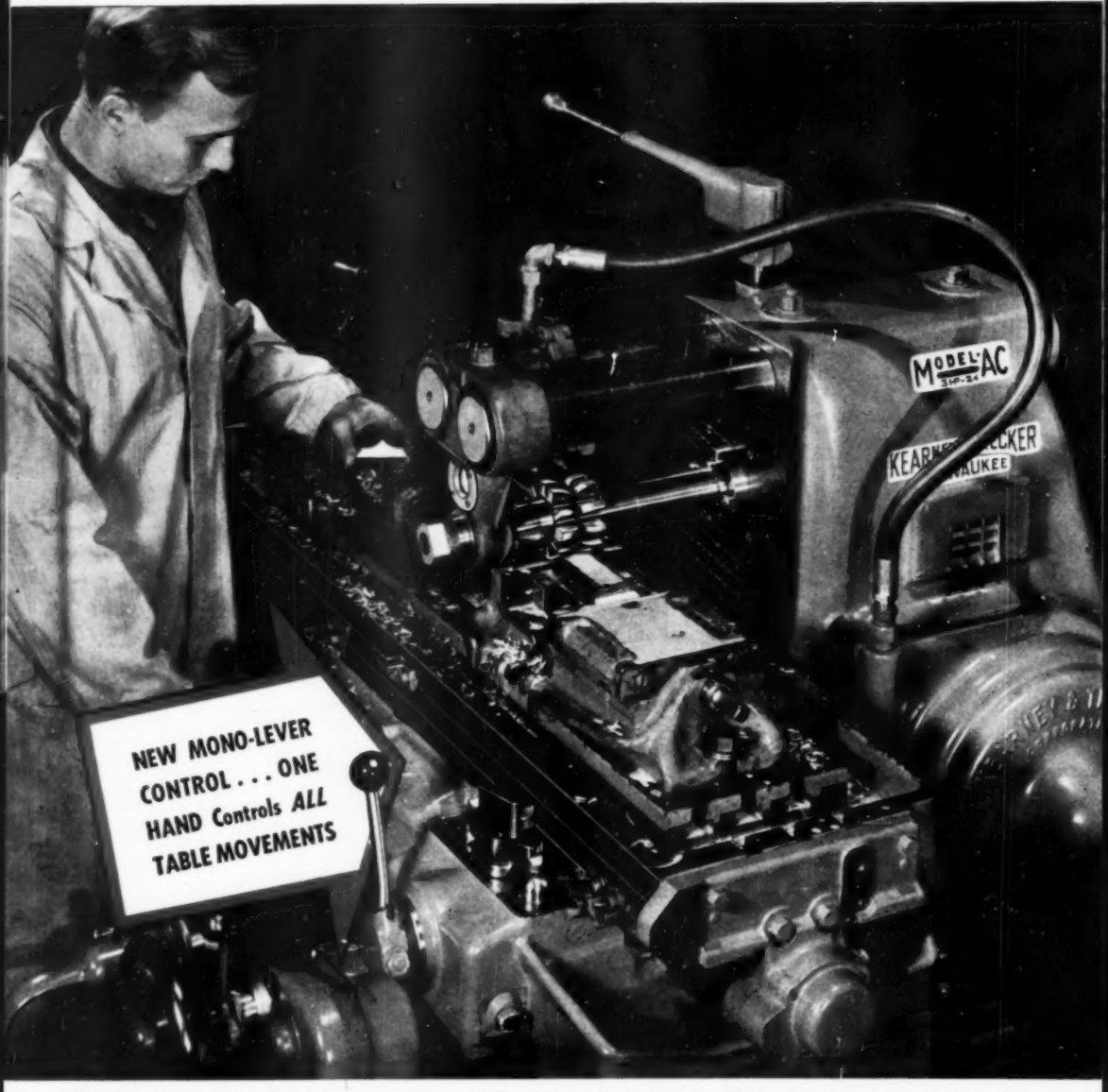
Maybe Everdur can help. Our Technical Department is always ready to serve. Just write to The American Brass Company, Waterbury 88, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

Where corrosion resistance counts

**ANACONDA**

**COPPER-SILICON ALLOYS***

# Now in the 3hp range..FOUR NEW MACHINES FEATURING



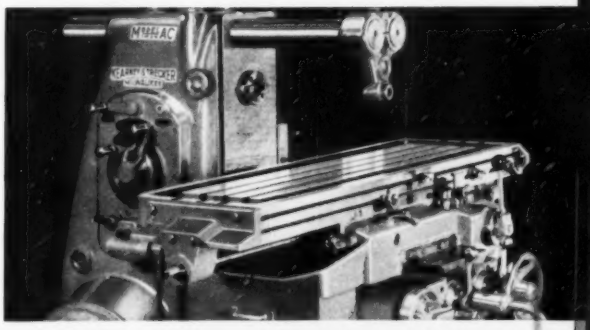

Camera study of good management at work! The job—form mill two radii on medium steel wedge plates. Fine finish required. With new Kearney & Trecker 3hp Model 24-AC machine, operator sets up automatic table cycle for reciprocal milling and easily paces production using climb and conventional milling alternately. RESULT: 28% savings in loading time, reduced scrap, more uniformity, less operator fatigue.

# KNEE-TYPE MILLING MONO-LEVER CONTROL

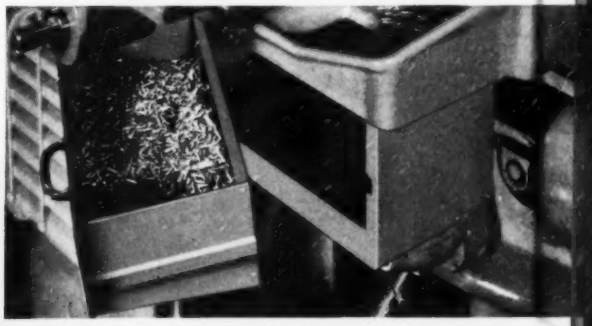
YOU asked for them — Kearney & Trecker milling machines in the 3hp range with Mono-Lever Control and Automatic Table Cycle. Here they are — your choice of two different styles, plain or vertical with either 18" or 24" table feed.

These machines offer you features never before available on machines of this size and type: 33% larger table working area plus built-in deep-well coolant troughs all around — extra large (2" dia.) precision-ground table screw with adjustable nut to eliminate backlash — drawer-type chip containers for easy chip removal — positive metered lubrication of the saddle and table ways and table feed mechanism—six-way power rapid traverse — automatic spindle stop — and quick-change feed and speed selection.

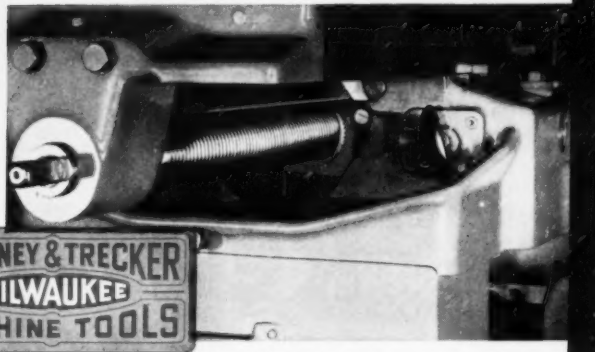
Don't wait. It costs you nothing to find out today about these new machines. See how they can meet all around big or small job requirements in your shop. For detailed information call our nearest representative or write direct to Kearney & Trecker Corporation, 6784 West National Avenue, Milwaukee 14, Wisconsin.



You get 33% more table working area on these new machines — 38" x 14" on Model 18-AC and 44" x 14" on Model 24-AC. This means greater adaptability to handle more jobs.



Convenient, removable drawer-type chip containers simplify chip control and "housekeeping" on the job — improve working conditions for operator—screen chips from coolant return.



KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

New 3hp Model 24-AC plain style Kearney & Trecker milling machine featuring Mono-Lever Control and Automatic Table Cycle . . . ask about it or the vertical style equivalent today!

Adjustable table screw nut on precision-ground 2" diameter screw eliminates backlash—makes climb or conventional milling equally easy . . . assures uniform, accurate results.

# Speedy Accurate Milling Saves Labor!

On countless jobs—Kent-Owens Milling Machines have shown ability to turn out work with top speed and high accuracy. They're designed for rapid, easy set-up and operation. Rugged . . . with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more* . . . with *lower costs!* Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with tooling and special machine requirements.

Kent-Owens Machine Co., Toledo, Ohio.

**No. 2-20** . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

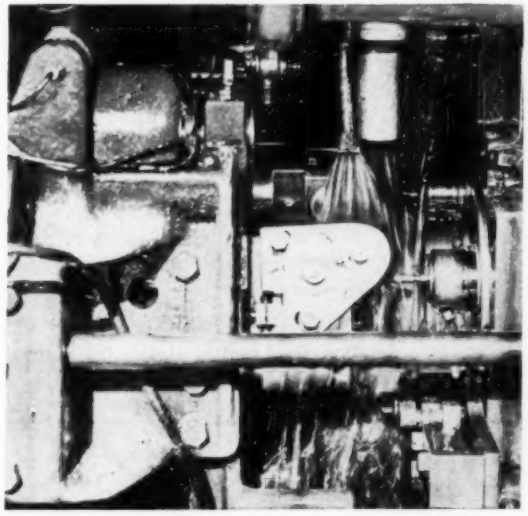
**No. 2-20 DS** . . . Double Spindle for two milling operations . . . 20" table travel . . . 42"x12" table. Hydraulic feed.

**No. 2-20V** . . . 20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42"x12" table. Hydraulic feed.

## Call on KENT-OWENS For Milling Machines

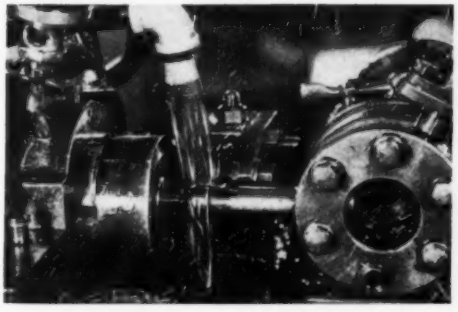
# BEST ALL AROUND

## CUTTING OILS NOW READY FOR YOUR SHOP



**Eight Hours, No Shutdown.** This automatic screw machine, using the new oil on SAE X1315 steel, on forming, facing and cut-off, increased tool life from 2 hours to 8 hours.

**Production Almost Doubled . . .** This automatic, using the new oil on SAE 1315 steel traveling 225 s.f.m., made switch part in 5 seconds, twice as fast as with other oils.



**Drill Life Doubled . . .** A new S/V Vacmul was used on this hand screw machine, doing a secondary drilling operation on SAE 1113 steel. Drill life was doubled.

### Light-Colored, Transparent, Non-Corrosive

## *S/V VACMULS PROVED*

### on Many Metals, Many Applications . . .

Here's the answer to your need for a general purpose cutting oil that is non-corrosive, yet has the highest cutting efficiency yet developed in this type of oil.

The new, vastly improved S V Vacmuls have proved their superiority on a variety of metals and on a wide range of different machining operations.

Light-colored, transparent and odorless, these oils possess exceptional extreme pressure and oiliness characteristics. They give excellent results in job shops and other shops where a single oil is required to do a variety of work.

Operators who have used them in exhaustive tests report greatly increased tool life, improved finish, reduced rejects and production speeded up all along the line. Be sure to get performance facts and figures from your Socony-Vacuum Representative.

SOCONY-VACUUM

GARGOYLE

Lubricants

*Rely on*

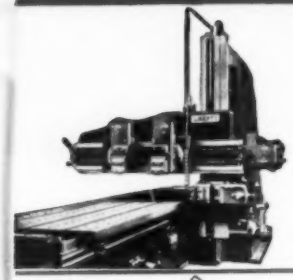
**SOCONY-VACUUM**

*Correct Lubrication*

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

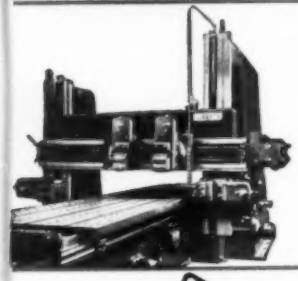
# LIBERTY

## BUILDS 3 great PLANERS



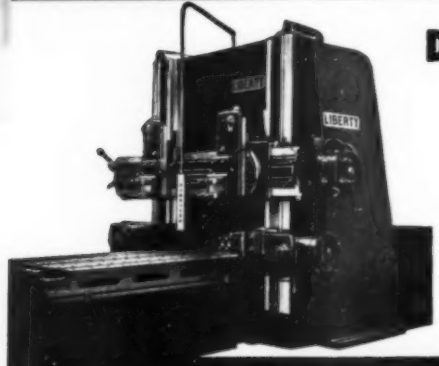
### OPEN SIDE

For shops handling work of variable widths. Wide-faced housing and motorized clamp give rigidity for heavy roughing cuts and finishing. Dual control; electric feeds; rapid traverse to all Heads in all directions.



### CONVERTIBLE

For exceptional rigidity on variable widths. Two, three or four heads. Offset heads permit closest approach of tools. Double balanced driving gear and pinions. Extreme accuracy.




### DOUBLE HOUSING

For rapid production combined with accuracy. Two, three or four heads. Extremely rigid; handles production work with maximum cutting feeds and speeds. Table pulled into tool. Electric clamping and dual control for ease of operation; high production.

***Write for catalog giving complete details.***

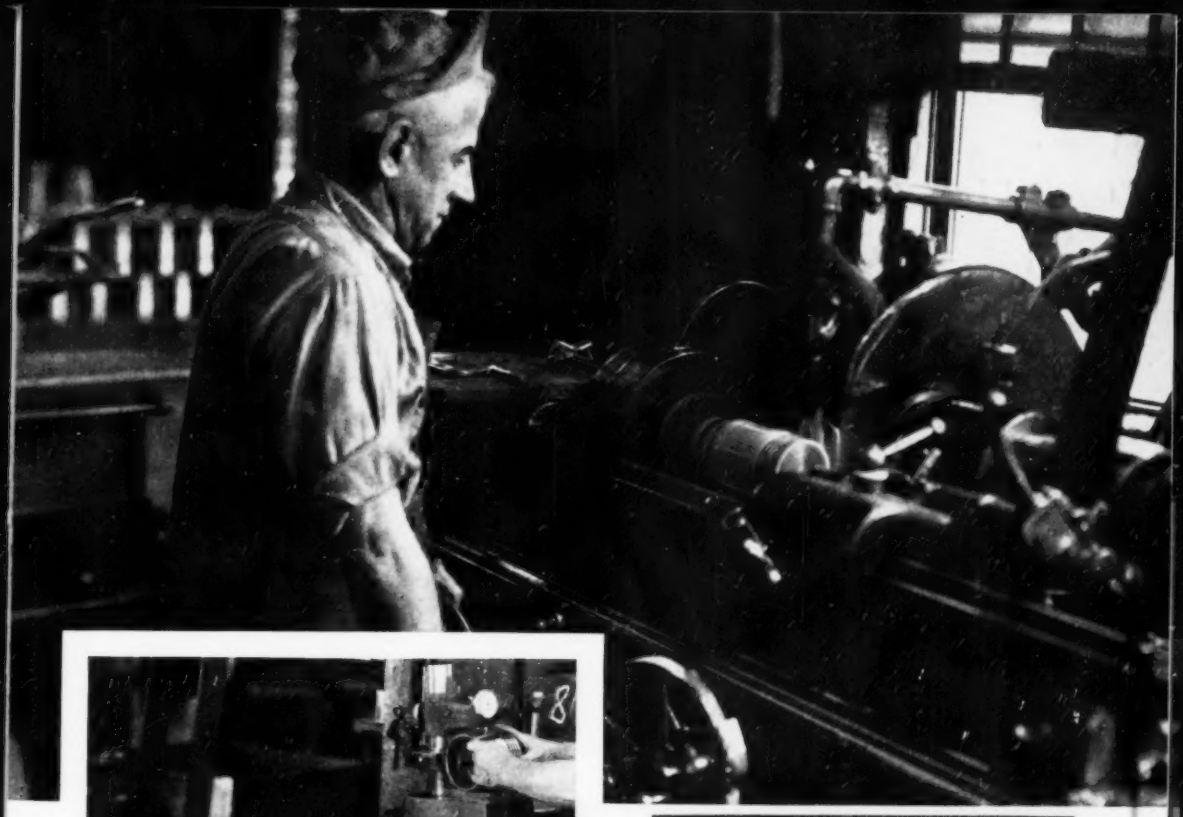
All lengths, 24' x 24' wide and larger.

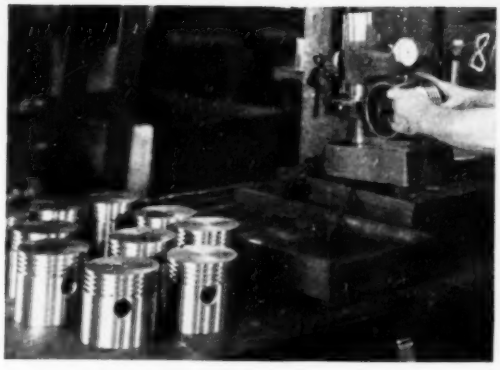
**LIBERTY PLANERS, INC.**

**HAMILTON, OHIO**

**GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 W. MADISON ST., CHICAGO 6**

*Exclusive Representatives in All Principal Cities*





# SUPERLA Soluble Oil

## Gain these benefits for your grinding operations

AIMING at higher production and economy, a midwest plant tried various soluble oils for the cylindrical grinding of cast-iron automotive pistons. Approximately .001 of an inch of stock is removed. Six Norton grinding machines are used on the job.

Of the products tried, Superla Soluble Oil proved superior to any and helped this plant reach its goal through these benefits:

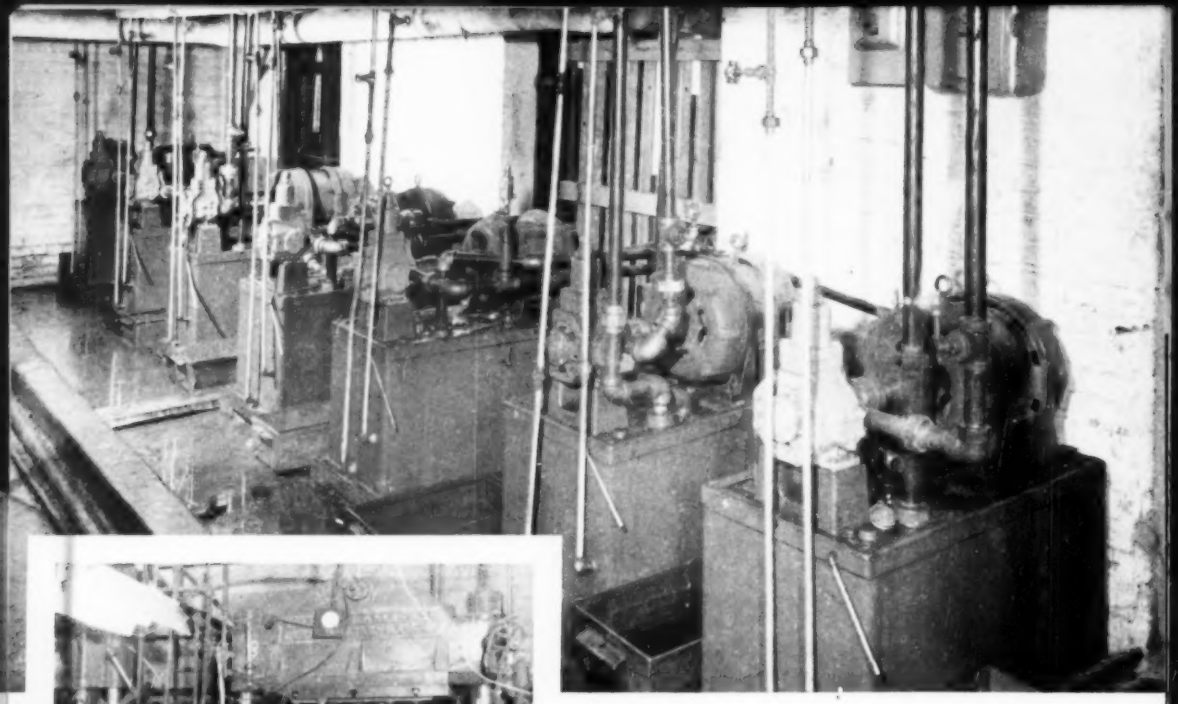
**Fewer wheel dressings.** 70 to 80 pistons are produced before wheels need dressing as compared to an average of 30 to 40 pistons obtained with other soluble oils. This amounts to a big saving through reduced time and labor for dressing wheels.

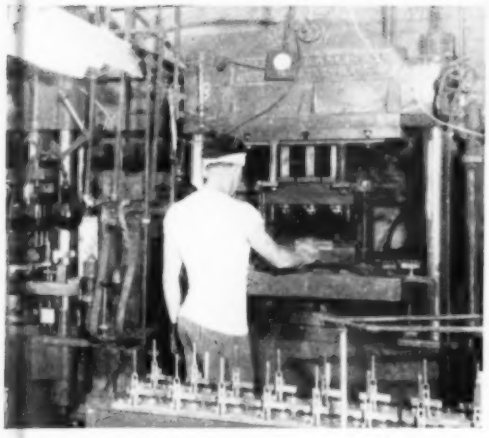
**Greater production.** Less interruption for wheel maintenance adds approximately 40 minutes to the daily production time of each machine.

The shop foreman reports still other advantages in using Superla Soluble Oil. Piston diameters are easily kept within a tolerance of .0005 to .001 of an inch. There are no rusting troubles. Superla emulsions do not turn rancid and produce objectionable odors.

Why not gain these advantages offered by Superla Soluble Oil – advantages that will help you, in turn, to get greater production and economy in your plant. If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Cutting Oil Engineer nearest you.

**STANDARD OIL COMPANY (INDIANA)** STANDARD





# Stanoil 95 Industrial Oil

## Are your hydraulic operations as free of trouble as this?

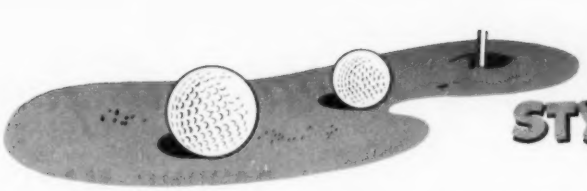
THE HYDRAULIC UNITS shown above are used for the operation of plastic-moulding presses in a midwest plant. Hydraulic oil pressures reach 2500 psi. Oil temperatures average between 120° and 150° F. Presses, operating on a three-shift basis, require 24-hour operation of the hydraulic units.

Stanoil 95 has been used as the hydraulic medium in these units for well over a year. During this period of hard, continuous service, the hydraulic oil systems have required no cleaning. No oil changes have been necessary. Hydraulic controls have functioned smoothly.

How does this hydraulic oil performance compare with that in your plant? If you are experiencing trouble with oil deposits, oil deterioration, or oil foaming, you can benefit by changing to Stanoil. This multi-purpose industrial oil contains an oxidation inhibitor and an anti-foam additive that contribute to long oil life and clean, reliable operation of hydraulic units, speed reducers, and circulating systems.

If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Oil Lubrication Engineer nearest you.

**STANDARD OIL COMPANY (INDIANA)** STANDARD



# STYMIE!

A sales slump had this manufacturer of small engines under a cloud. He knew he could land a juicy power lawnmower account if he could reduce the weight of his engine. And he knew magnesium parts would make his product lighter, but thought he'd be stymied by new and difficult machining problems. Then he consulted Aluminum Company of America, light metal headquarters. Simple shop practices, he found, make handling magnesium no problem . . .* He discovered, too, that every month industry uses over a million pounds of this modern metal . . . He got helpful technical information, plus books on designing and fabricating magnesium. Now he's pacing competition with a lightweight engine, using American Magnesium Sand Castings for both the cylinder head and the crankcase.

*No change in insurance rates.

*These two, free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, sales agent for American Magnesium Products, 2107M Gulf Building, Pittsburgh 19, Pennsylvania.*

MAZLO
MAGNESIUM PRODUCTS

**AMERICAN MAGNESIUM CORPORATION**

**SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA**

# *Only* MARVEL *builds all four**

***HACK SAWING MACHINES**

***BAND SAWING MACHINES**

***BAND SAW BLADES**

***HACK SAW BLADES**

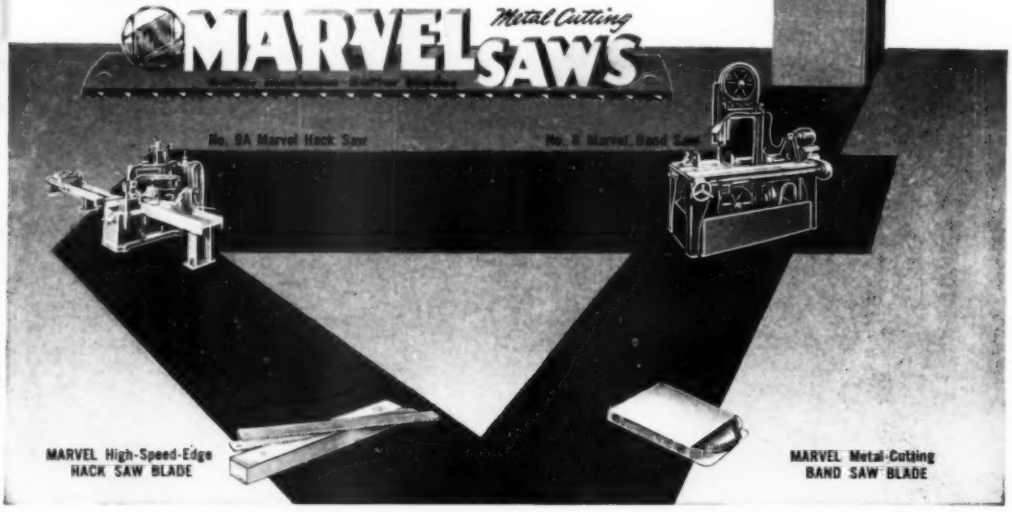
While it is true there are several builders of hack sawing machines and many builders of band sawing machines, only MARVEL builds *BOTH* hack saws and band saws. The fact is that MARVEL manufactures 35 models of 10 basic types of metal sawing machines which include the world's fastest automatic production saw, the world's largest giant hydraulic hack saws, the world's most versatile band saw and the most widely used small shop saws.

With intimate and broad field experience in all types of metal cutting-off equipment and 35 different saws available, it is obvious that MARVEL Field Engineers occupy a unique and exclusive position in the industry. They are eminently qualified to make expert and *unbiased* recommendations covering the type, size and model of metal sawing equipment best suited to individual requirements—the most efficient, most accurate, fastest, broadest in scope and the most economical.

MARVEL is also the only manufacturer of both metal sawing *machines* and metal sawing *blades*. Because the efficiencies of both the machine and the blades are interdependent, each upon the capability of the other, expert knowledge covering both saws and saw blades is essential to the proper appraisal of any specific sawing situation. Correct balance of cutting speed and blade life, feed pressure and blade tension are all potent factors in over-all performance. Here again it is the MARVEL Field Engineer who is qualified to provide the comprehensive answer to your question. His job is to help you saw metal most efficiently—his services are available upon request—gratis.

***Write for Catalog 49***

**ARMSTRONG-BLUM MFG. CO.**
BLOOMINGDALE AVE., CHICAGO 39, U.S.A.


Metal Cutting
MARVEL SAWS
No. 9A Marvel Hack Saw
No. 8 Marvel Band Saw
MARVEL High-Speed-Edge HACK SAW BLADE
MARVEL Metal-Cutting BAND SAW BLADE

Variable Idle Time Control
Gear Box Transmission Support
Idle Time Movement Brake Adjustment
Headstock Transmission Support
Endworking Attachment Spindle Mounting
Support by Work Spindle Carrier
Tool Holder Anchorage
Approved Types of Clutc
Job Changeover Facility
Power Reverse Drive Support to All Toc
Machine Builder's Block and Line Test
Material and Fir
Proximity of Front Bearing to Carrier Face, o
Proximity of Front Bearing to Spindle
Support by Work Spindle
Support by Main End Slide
Support by Work Spindle Carrier Indexing Fa
Length of Standard Main End Slide
Top Member Support to All Headstock and Gear Box Members
Maximum Machine Main End Slide Load Recommended
Support by Main Cross Slides
Form Tool Holder Interchang
Location of Tooling Stations in Respect to Chip Clearance and Size Control
Gear Material, Size and Finish
Main Cross Slide Position Adjustment
Main Cross Slide Positive Stops
Main End Slide Replacement
Camshaft Replacement Facility
Minimum Overhang

BUYER'S
COMPARISON CHART
FOR
MULTIPLE SPINDLE AUTOMATIC
BAR MACHINES

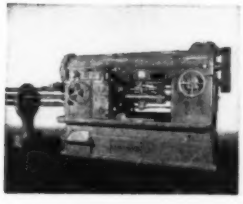
# FULL INFORMATION PLEASE

**Buyers of machine tools** usually want ALL of the information about a machine, not just a part of it. And, with all of the information, they will give special attention to those things that have a bearing on their own particular requirements.

**Case histories** of machine performance in other plants clearly indicate that requirements often vary. But, for any requirement, machine performance is dependent on machine facility, and there is no better way of predetermining satisfactory quality performance than by determining a machine's quality facility.

**All brands** of a given type of machine offer value worthy of due consideration. A fair comparison of their facilities, in accordance with the requirements they must meet, is a logical means of establishing a preference.

**For those interested** in determining the facilities of multiple spindle automatic bar machines CONE has made available an analysis chart. It is designed to help guide you to ALL the information. Your copy is free. There is no obligation.



*A comparison will lead you to*

**Conomatic**

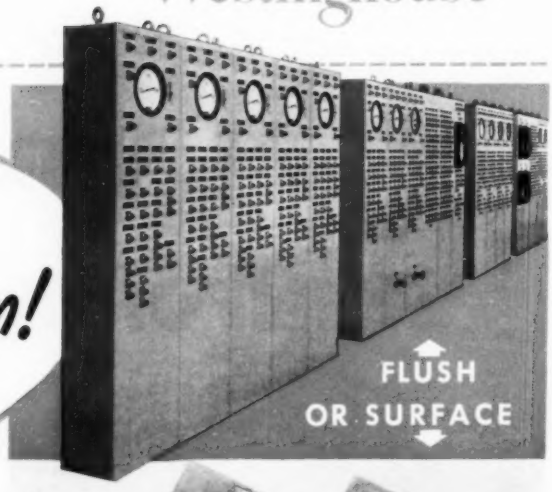
CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

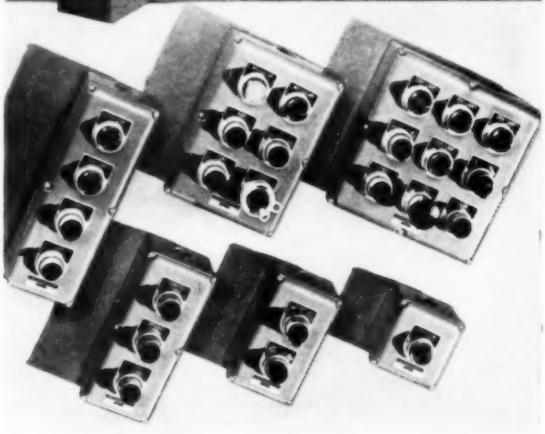
YOU CAN BE **SURE**.. IF IT'S

Westinghouse

**STAN CONTROL SEZ...**

*Mount 'em as you want 'em!*



Westinghouse Oil-Tite Control Stations and Units improve control operations on all types of pilot-control circuits and controllers. Their unit flexibility makes possible attractive installations to suit particular needs.

For surface mounting, they are available in handsome, die-cast Bonderized enclosures. The sleek design and smooth, baked enamel finish harmonize with modern industrial design. Contact blocks may be mounted in the base, eliminating flexible leads from box to cover. Nine operator assemblies and six enclosures provide circuit combinations for any requirement.

When it is desired to mount units in machine cavities, or in banks in large control stations, the contact blocks may be mounted in the conventional manner. For flush mounting in machine cavities, the controls can be purchased with covers only, which become convenient and attractive flush plates.

Get complete information from your nearby Westinghouse office. Ask for bulletin DB-15-022. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-30010

**Westinghouse**
***Oil-Tite***
**CONTROL STATIONS**

Card's system of *double* inspection — in the factory and independently, by the Pittsburgh Testing Laboratory — is your *double* assurance of satisfaction when you specify Card Taps... See your nearest Card Distributor for prompt, dependable service.

# S.W. CARD

**MANUFACTURING COMPANY**
**Mansfield, Massachusetts**
*DIVISION OF UNION TWIST DRILL CO.*

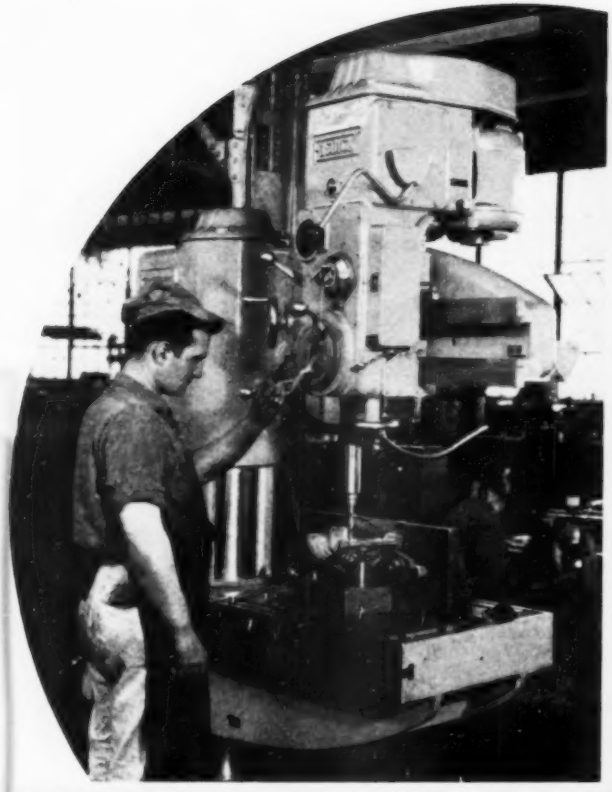
The CARD Quality

TAPS

*The Certified* Cutting Tools*

*by the Pittsburgh Testing Laboratory

Also makers of DIES · SCREW PLATES
DIE STOCKS · TAP WRENCHES



*For* PRODUCTION
*For* MACHINE SHOPS
*For* TOOL ROOMS

# FOSDICK *Sensitive* RADIAL

● Wherever there's a need for holes up to 1½" diameter it will be to your advantage to investigate this exceptionally versatile machine.

The sturdy construction of the Fosdick Sensitive Radial from base to arm—the rigid one piece column—the heavy adjustable table—and the massive arm all contribute to accurate, dependable production.

Ease of operation is assured due to centralization of controls on the head within easy reach of the operator at all times. Both table and arm swing in an arc of 360°. The adjustability of the table enables operator to locate the table in correct position for every job. It also enables him to swing the table out of the way in the event an emergency tall job comes up that may be mounted on the conventional base.

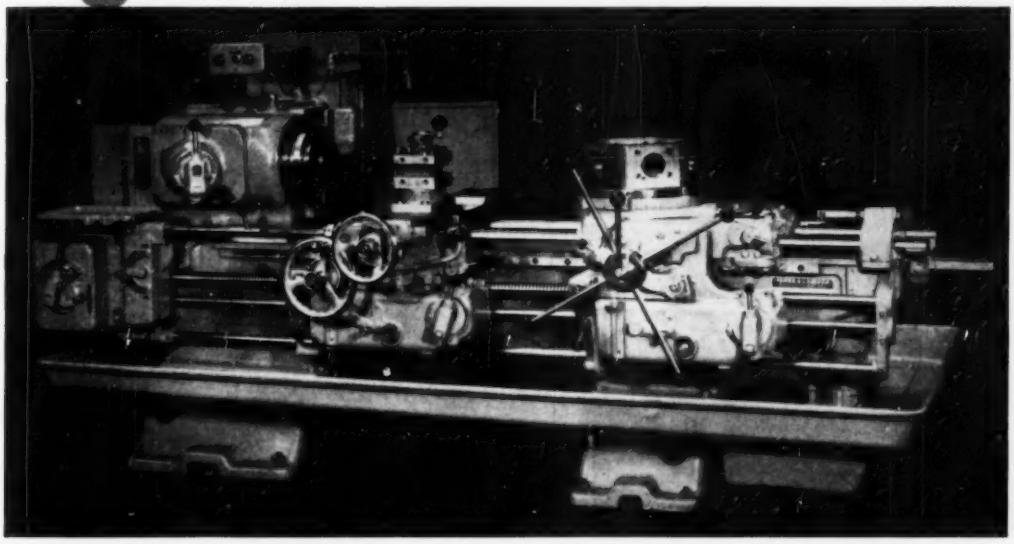
The Fosdick Sensitive Radial offers all the advantages of high speed sensitive drilling plus the versatility of radial design and construction.

The illustration shows an installation in a machine shop in eastern Pennsylvania. Whether yours is a production plant—a machine shop—or a tool room you'll find this machine is a most profitable investment.

*For complete details write for the Fosdick Sensitive Radial Bulletin—S.R.A.*

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

# Over 4½ Tons of High Powered Precision!



## NEW JONES & LAMSON SADDLE TYPE 7A UNIVERSAL TURRET LATHE

2½" Bar or 12" Chuck

**Rugged, Functional Design, Heavy, Deep, Rigid Bed Gives New Production Efficiency**

**Full Length Lead Screw:**

- *Carriage and Saddle Threading to Full Turning Length*
- *Wide-Range, Single Lever Thread Selector*
- *All-Sliding Gear Quick-Change Gear Box*
- *Automatic Safety Interlocks on Threading Controls*

**Power Rapid Traverse for Cross Slide and Saddle—Power Indexing Turret**

**Lower, Wider Chip Pan with Centrifugal Coolant Pump**

**12 Spindle Speeds with 20 Horsepower Constant Speed Motor**

**All Tooling Interchangeable with Previous 7A Models**

— ***PLUS*** all the famous Jones & Lamson characteristics of easy operation, versatility and repetitive accuracy!

**Built & Powered to Produce *MORE chips per tool, MORE pieces per hour, MORE profit per job* — than any turret lathe of comparable size!**

*Turret Lathe Division* **JONES & LAMSON** MACHINE COMPANY
Springfield, Vermont, U.S.A.

*MACHINE TOOL CRAFTSMEN SINCE 1835*

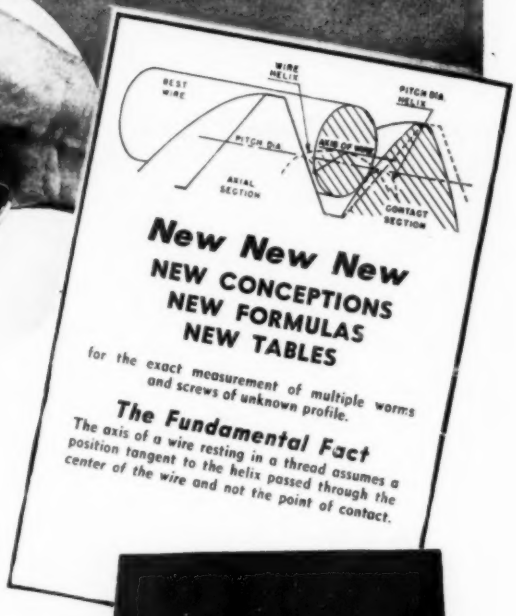
*Write to Dept. 710 for Complete Information*

# Van Keuren MEASURING WIRES

## STANDARD EQUIPMENT...

## ...everywhere

Measuring the pitch diameter of a 1"-8 National Form thread gage. This method is recommended by the Bureau of Standards.




**New New New**

**NEW CONCEPTIONS**
**NEW FORMULAS**
**NEW TABLES**

for the exact measurement of multiple worms and screws of unknown profile.

**The Fundamental Fact**

The axis of a wire resting in a thread assumes a position tangent to the helix passed through the center of the wire and not the point of contact.

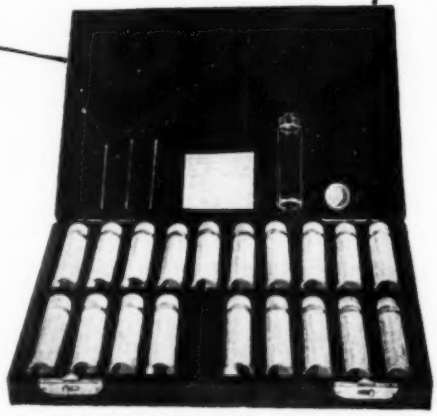
Van Keuren Measuring Wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. Reputable manufacturers of ground taps and thread gages used for the production and acceptance of threaded holes and nuts use Van Keuren Measuring Wires. You will seldom find them in error if you, too, have Van Keuren Measuring Wires.

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

*Copies free upon request.*



Set. No. 20 Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

| | |
|---|---|
| Price, High Speed Steel Wires | $ 95.00 |
| Price, Carboloy Wires | 240.00 |

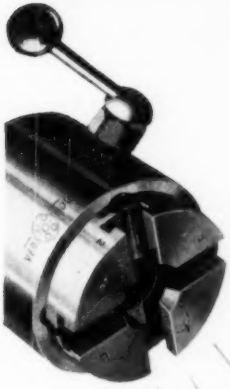
Special wires from .002" to 2.000" diameter are made to any tolerance required.

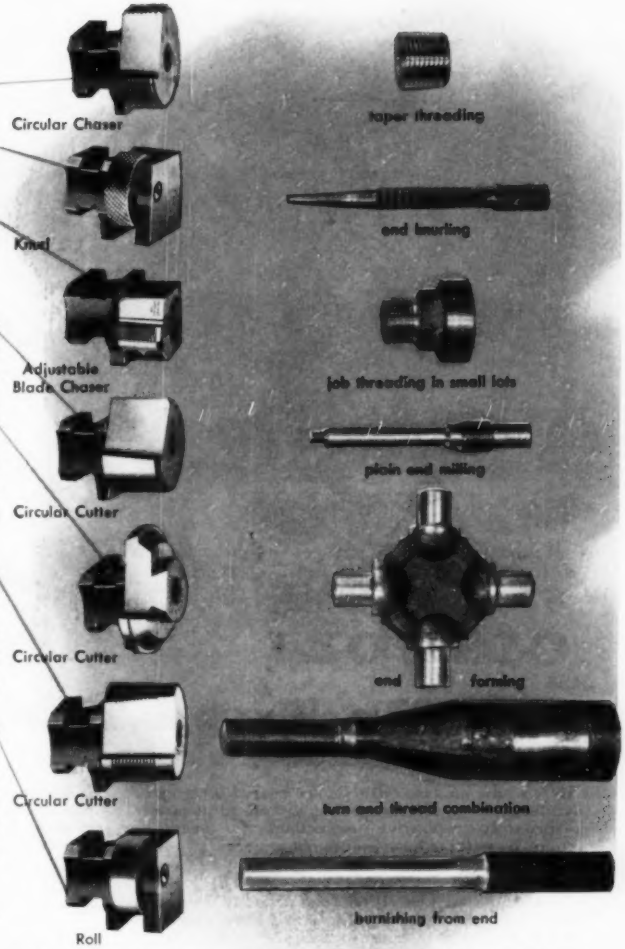
**THE Van Keuren CO.,** 173 WALTHAM STREET, WATERTOWN, MASS.

**30th YEAR**

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

# You name the job...VERS-O-TOOL has the cost-cutting answer






Whenever you need accurate, *economical* threading or forming cuts, there's no faster way than to use Nanco chasers or hollow milling cutters, interchangeable, size for size, on *the same* Vers-O-Tool head. Regardless of your lot size, there's a chaser or cutter exactly suited to your needs—*and your production budget.*

An important part in the savings you'll make on such jobs stems from this versatility of Vers-O-Tools. Less money is tied up in tool inventory. But there are other savings, too: longer tool life, faster production, fewer rejects.

And Vers-O-Tools are space savers. You can use them on many jobs where other die-heads won't fit in. What's more, quick diametric adjustment of the cutters permits set-up in a matter of seconds.

Like more facts? Ask for Catalog D-49.

**24-HOUR DELIVERIES ON STANDARD STOCKABLE NF AND NC CHASERS WITH BLOCKS**

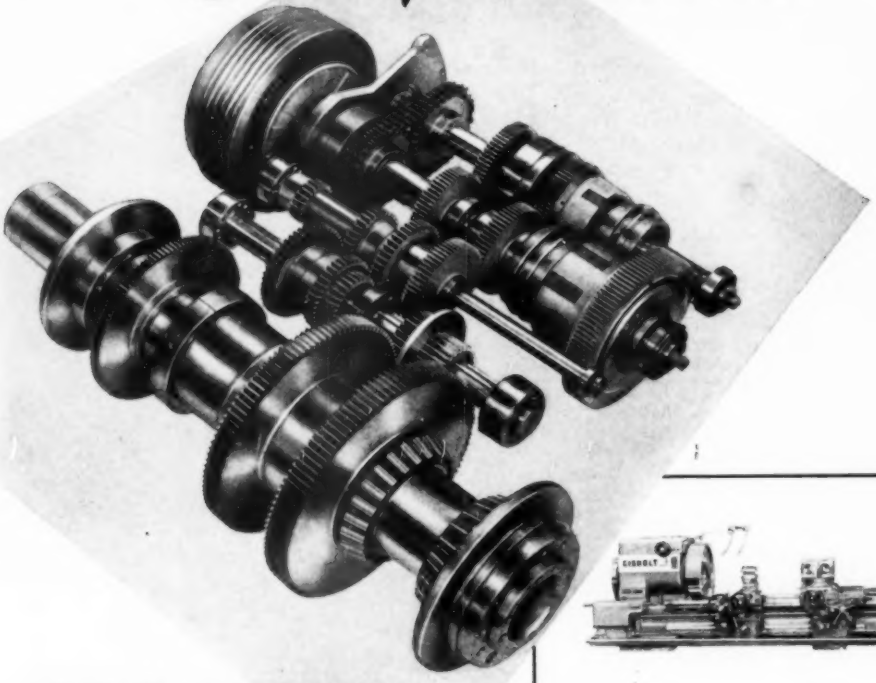
## The NATIONAL ACME CO.

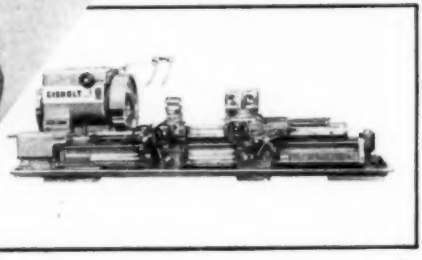
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

# RUGGED POWER

## *Silky Smooth*





# GISHOLT

## Saddle Type Turret Lathes

Here's how modern Gisholts are geared for greater production—to deliver smooth, vibrationless power—instantly responsive—dependable for years to come. Note these outstanding features:

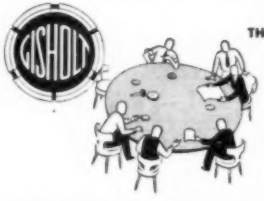
**1** *Gears* . . . Husky headstock gearing will carry all the horsepower and all the load of today's tools, as well as that of the foreseeable future. Rigidity is complete from the massive headstock casting right through to the ground teeth in each gear.

**2** *Clutches* . . . Warner Electric Clutches inside the drive pulley do all forward and reverse driving, as well as inching and braking. They never need adjustment and give the smoothest acceleration and braking power ever put on a turret lathe. Instant HI-LO speed changes are obtained at the touch of a finger through hydraulically operated multiple disc clutches.

**3** *Bearings* . . . Two precision tapered roller bearings at the front of the spindle, together with the precision ball bearing at the rear, carry all the radial and thrust load you can give them.

Why not get all the facts? A new bulletin on Gisholt 3L, 4L, 5L Saddle Type Turret Lathes is just off the press. Write for it.

**GISHOLT MACHINE COMPANY**
Madison 10, Wisconsin

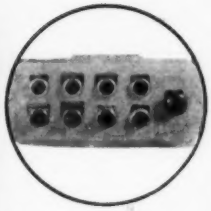



**THE GISHOLT ROUND TABLE**
*represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

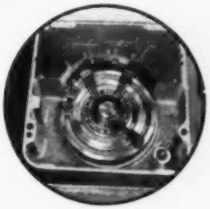
**TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES**

**No. 16-16** *Features*

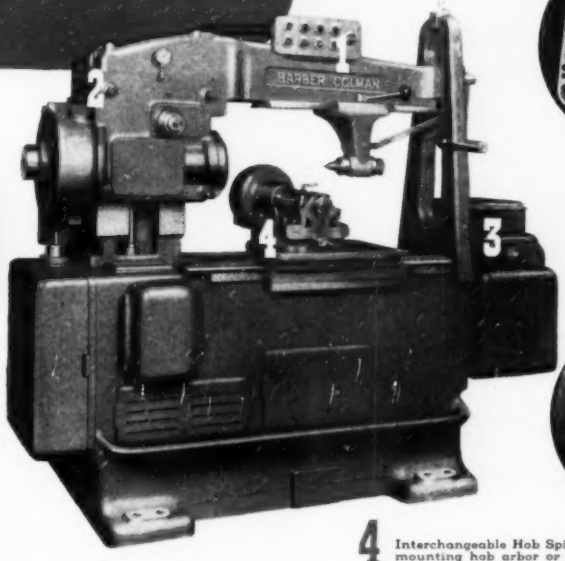
## QUICK, EASY CHANGEOVER FOR ECONOMICAL GEAR HOBBING



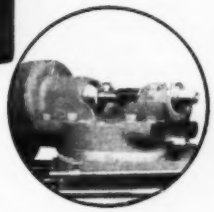
**1** Push-Button Panel for finger-tip control of hob and hob slide.



**3** Dial Stop Selector controls feed and traverse, furnishing selection of stops, conventional and climb hobbing.



**2** Hob Rotation Selector reverses main drive motor and changes direction of hob rotation.



**4** Interchangeable Hob Spindle (special) for mounting hob arbor or shank type hob.

Minimum set-up time is one of the outstanding cost-reducing features of the Barber-Colman No. 16-16 Hobbing Machine. Push-button controls — quick, easy tool changes — instantaneous selection of feed, traverse and hob rotation — enable the operator to set up his machine and begin producing sooner.

The No. 16-16 Machine also offers a method of hobbing a wide variety of work, with quick, easy changeover from one job to another, and minimum requirements for maintenance and supervision.

Your Barber-Colman representative can give you full details and production estimates. In the meantime, if you do not have a copy for your files, write for new Bulletin 1149.

**Barber-Colman Company**

GENERAL OFFICES AND PLANT, 1149 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

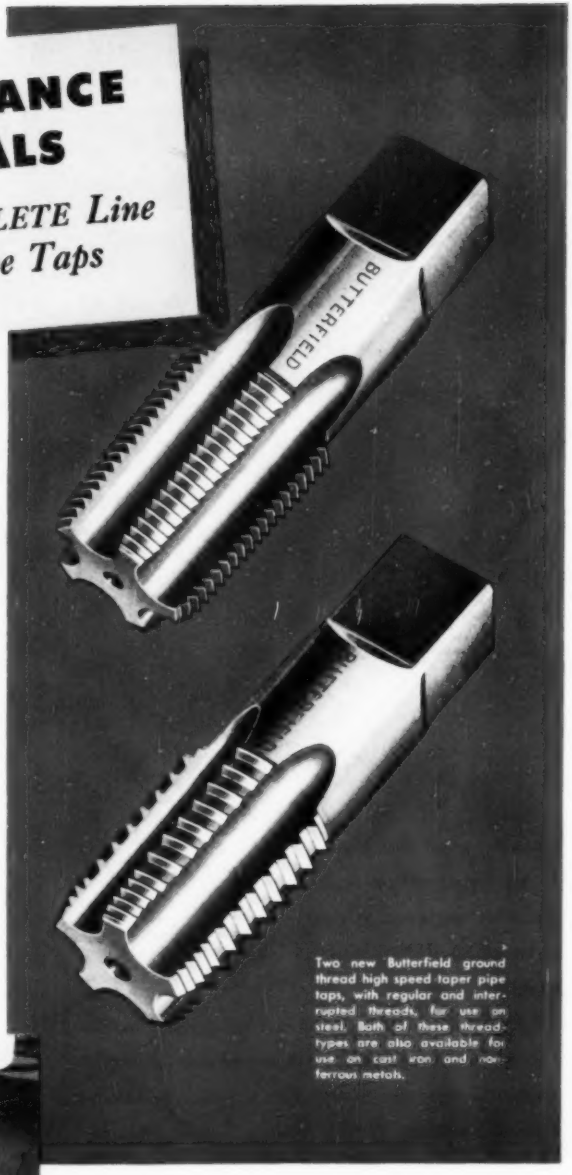
# TOP PERFORMANCE IN ALL METALS

## *With Butterfield's COMPLETE Line of 100% Inspected Pipe Taps*

Working with some of the largest industrial users, Butterfield has achieved distinct advancements in the performance of pipe taps. Notably, in the development of a special type for steel and another for cast iron and non-ferrous metals — both of which have been thoroughly proved in actual use.

Among other Butterfield contributions in the pipe-tap field you'll find a full range of dryseal-form taps, taper and straight, with ground threads. Eliminating the annoyance of compounds, their Butterfield-engineered accuracy is your assurance of faster, easier, lower-cost sealing of joints and fittings.

Butterfield taper pipe taps are available with ground or cut threads, regular or interrupted, also regular straight, in high speed steel and with regular taper or straight threads in carbon steel — *all individually inspected* . . . See your nearby Butterfield distributor for prompt service. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.




Two new Butterfield ground thread high speed taper pipe taps, with regular and interrupted threads, for use on steel. Both of these thread-types are also available for use on cast iron and non-ferrous metals.

Checking pitch diameters with wires, by the pressure method. Some of the specialized equipment used in Butterfield's 100% inspection.

**BUTTERFIELD**

**THE 100% INSPECTED TOOLS**

*Every Tool Individually Inspected*

TAPS • DIES • REAMERS • SCREW PLATES

# Same set-up time . . . Same standard tools

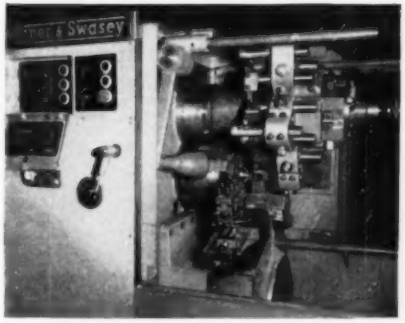
# PRODUCTION UP 357%

## . . . made more than 4 times faster at Chaplin-Fulton Manufacturing Company on Warner & Swasey 1-AC Single Spindle Automatic

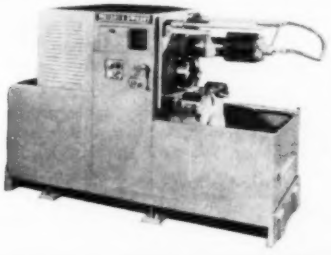
● The Chaplin-Fulton Manufacturing Company, of Pittsburgh, recently purchased a new Warner & Swasey 1-AC Single Spindle Automatic to produce accurate valve seats from 5¼" brass forgings. The new Camless Single Spindle Automatic now makes the part in less than one-fourth the time previously required.

- **The new Automatic was set up in the same setup time allowed previously . . . using the same shank type and cross slide tools.**
- **The new Automatic reduced the direct labor cost of operation over 78%.**
- **The new Automatic produced better, more uniform parts — reduced scrap loss — and cut inspection costs to a minimum.**

See for yourself how the 1-AC Single Spindle Automatic can cut *your* costs, turn out better work faster . . . pay for itself in a matter of months. Call the nearest Warner & Swasey office, or write Warner & Swasey, Cleveland 3, Ohio.




*Multiple cuts with standard shank type and cross slide tools helped reduce floor-to-floor time of this operation over 78% at Chaplin-Fulton. Ample clearances and* NO CAMS TO CHANGE *permitted easier and simpler setup.*



*It's Simpler to Set Up a Warner & Swasey*

WARNER & SWASEY
Machine Tools
*Cleveland*

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

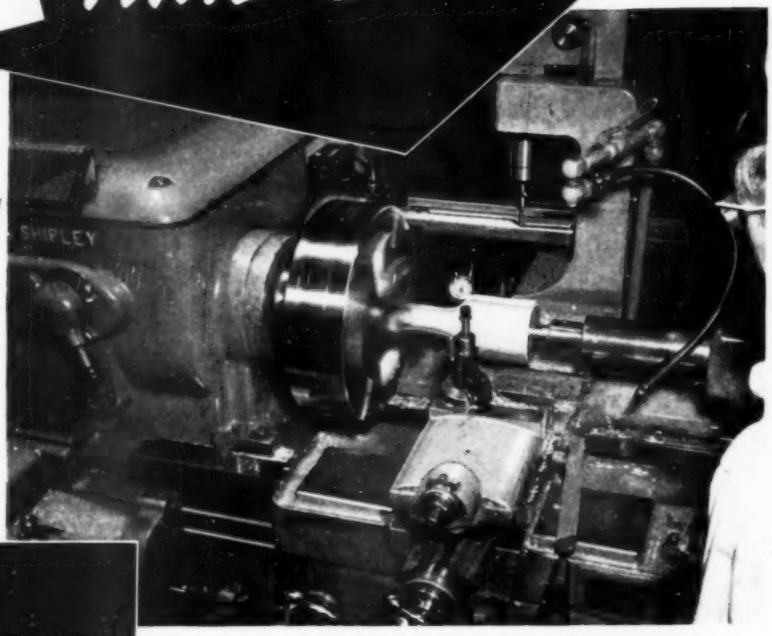
# 50% TIME SAVED

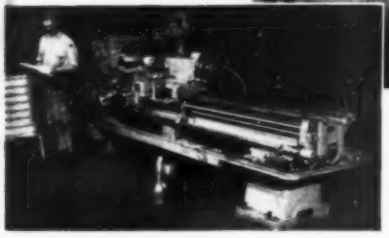
*...with*

**LODGE & SHIPLEY COPYMATIC**

*over other Lathes!*

says Wyman-Gordon Company
WORCESTER, MASS.



***DUPLICATE PARTS OR DO REGULAR LATHE WORK . . . get instant changeover ONLY with the COPYMATIC***

Wyman-Gordon Company is in an ideal position to analyze the performance of high production lathes. That's why their comment on the performance of Lodge & Shipley COPYMATIC Lathes is highly significant.

High accuracy, plus "better versatility" and "better output" gives this firm a time saving of "50% over other lathes." In the illustration, the COPYMATIC is contour machining aluminum extrusions, using a flat template for automatic duplication.

Where conditions do not warrant the making of a flat template, the first piece of a lot can be machined by standard lathe operation, then used as a template for the remainder of the lot. Features such as these, combined with the versatility of the Lodge & Shipley Model "X", give "special machine" high production rates without the usual cost.

The COPYMATIC can be a profitable producer in your shop. Ask your Lodge & Shipley Representative for additional details or write for Bulletin No. 675.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

# Gear errors and Gear noise

## should be discovered long before the gears reach final assembly . . .

There is a profit in scrap for the scrap dealer, but most certainly not for the gear manufacturer who suddenly discovers that an entire lot of gears have to be scrapped because they fail to meet tolerance requirements or because they are too noisy.

If economy is important in your plant, the time to find out about machining errors is right at the machine which causes the trouble—not after all the subsequent operations including heat treatment have been completed and the gears assembled in some power unit.

The best insurance against high cost of scrap gears is the use of gear checking machines right down there in the plant where the gears are being produced and where they can be checked periodically by the machine operators.

The Red Ring Gear Checker quickly reveals any dimensional errors and the Red Ring Gear Sound Tester immediately puts an accusing finger on noisy gears. Both machines have laboratory accuracy, they can be used anywhere in the plant or inspection department and they prevent a great deal of waste.

SPUR AND HELICAL
GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

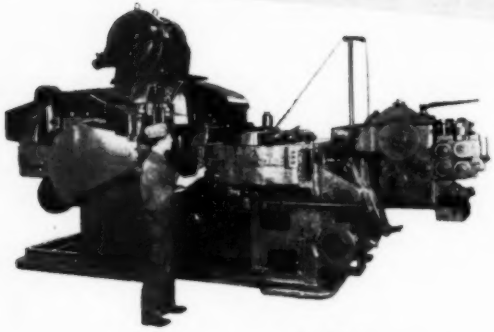
***Get all the details by writing for Descriptive Bulletins.***

**NATIONAL BROACH AND MACHINE CO.**

3600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

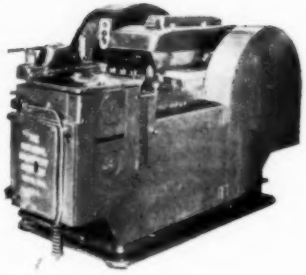
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

HIGH SPEED PRECISION TAPPER



BOLTMAKER

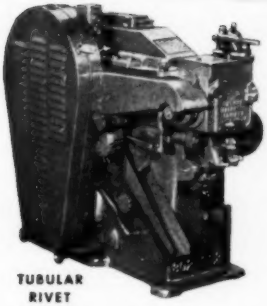
COLD NUT FORMER



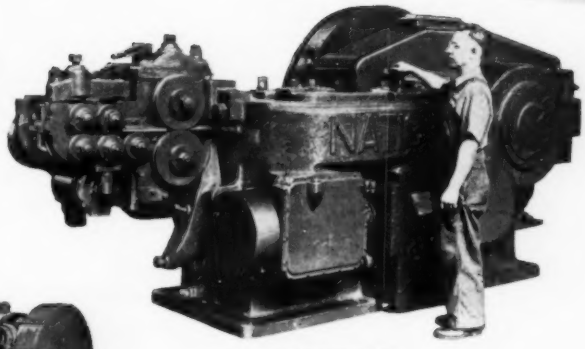
# 75th Anniversary
## 1874–1949

The National Machinery Company looks **back** with pleasure on 75 years of service devoted to the pioneering and development of new methods and machinery for the production of better and unusual hot and cold forgings at lower cost.

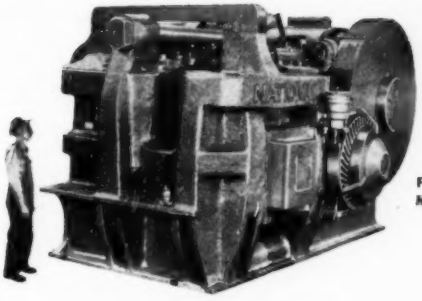
The National Machinery Company looks **forward** to continuing this program of cooperation with industry.



TUBULAR RIVET HEADER

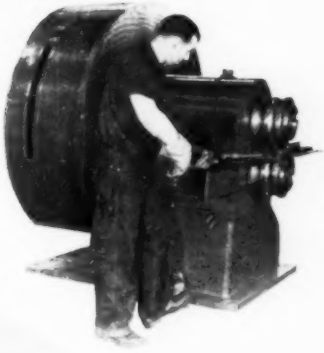


COLD HEADER

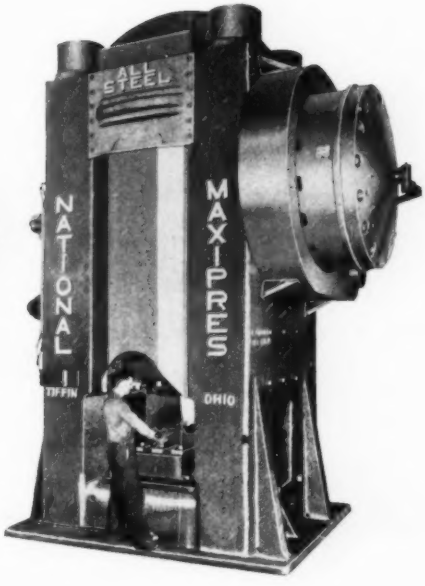


FORGING MACHINE

MAXIPRES



REDUCEROLL




# NATIONAL
## MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

New York Detroit Chicago

# ARMSTRONG

## ARMALOY

*Drop Forged*

## WRENCHES

ARMSTRONG ARMALOY — Wrenches are NEW. They are designed to meet the requirements of the mechanic who knows his tools and insists on using tools of Superior Quality.

ARMSTRONG ARMALOY — Wrenches are made from selected grade alloy steel. They are longer, lighter, thinner, yet stronger than the conventional alloy wrenches—heat treated to exact specifications of stiffness and tensile strength—better balanced, hence easier to use. Finished in chrome plate with heads buffed bright.

Armstrong Tools are stocked by leading tool departments.

Combination

Box Socket

Construction and Structural

Hex Box

Reversible Ratchets

Detachable Sockets and Sets

**ARMSTRONG BROS. TOOL CO.**

*"The Tool Holder People."*

5215 W. Armstrong Ave. Chicago 30, Ill.

# BORING and TURNING MILLS

# BETTS

**BUILT IN SIZES FROM 100" UP TO ANY REQUIREMENT**

*For full details on 100" Mill send for Bulletin No. 2129*

**BETTS 100" HEAVY DUTY BORING AND TURNING MILL**

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
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- RAILROAD SHOP TOOLS
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As in other Betts Boring and Turning Mills, this 100" mill is designed to provide a rugged, simplified general purpose tool that successfully combines accuracy, speed and power. Its features, many of which are exclusive, all contribute to this machine's reputation for outstanding performance; its production speed and accuracy, long operating life, safety of operation, convenience of control and all-around dependability under exacting operating conditions.

**BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848**

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CONSOLIDATED MACHINE TOOLS

# CONSOLIDATED

## MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Sixth in a series of
Unusual Grinding
Wheel Operations

# GRINDING WHEEL MEETS COCOA BEAN!

● The delicious chocolate flavor of Hershey's and other brands of chocolate, starts with the *grinding* of the dried cocoa beans. Pulverizing the bean by grinding, rather than by any other process, retains the original flavor.

Whatever *YOUR* grinding problem may be, *BAY STATE* can solve it . . . fast. Possibly the exact specifications to meet your requirements can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States.

Send us your grinding problems. We can help you.

*These mills, using fine, hard grinding wheels convert the dried cocoa beans into rich chocolate liquor. Courtesy of Hershey Chocolate Corporation*

**BAY STATE ABRASIVE PRODUCTS CO.**
**Westboro, Massachusetts, U. S. A.**

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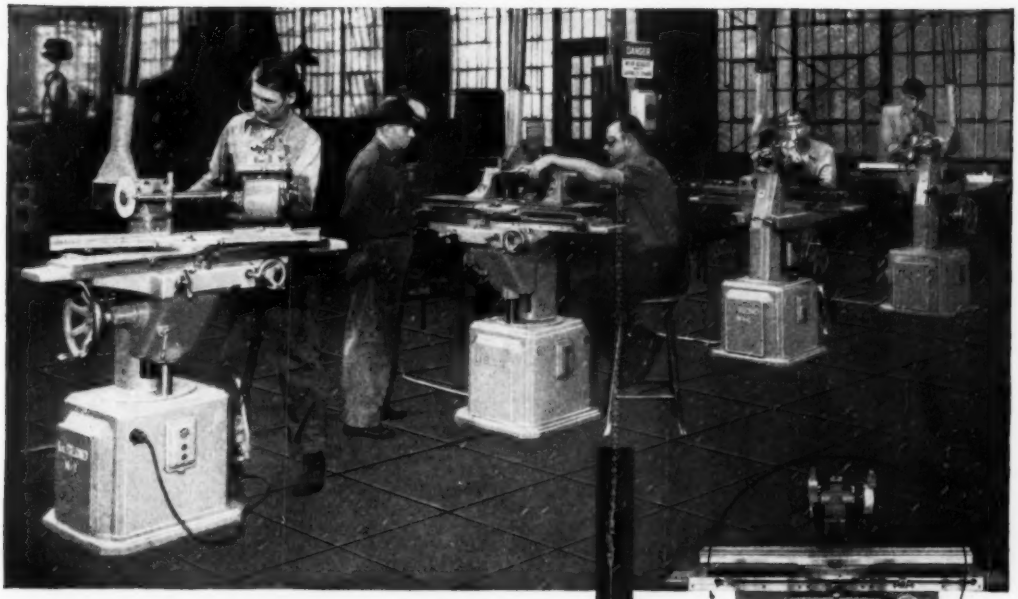
*Chicago, Cleveland, Detroit, Pittsburgh.*
*Distributors — All principal Cities.*

MEMBER OF THE
GRINDING WHEEL INSTITUTE

*Top Performance Consistently Duplicated*



## *get more flexibility in your tool room grinding with the LeBlond No. 2 Cutter Grinder*

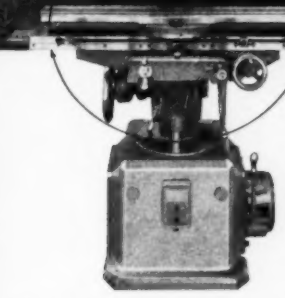
The flexibility for which the LeBlond No. 2 is noted is best illustrated by the photo above. You can operate it sitting or standing, from in front or in rear. Swing it around as you wish to get the precise angle required.

And you can count on the LeBlond No. 2 to deliver the correct speed for each job, because it is the only cutter grinder that gives you four speeds—6500, 5100, 4000, and 3100 rpm—easily and quickly.

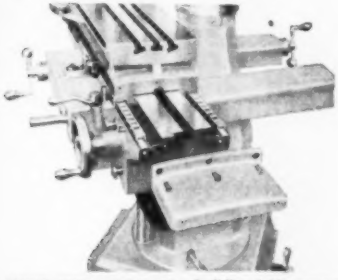
The LeBlond No. 2 offers so many ways of improving the quality and reducing the cost of tool room grinding, you won't be satisfied with anything less. Ask LeBlond distributor nearest you for descriptive bulletin today.

*send for*

your copy of the No. 2 Cutter Grinder bulletin. The valuable Manual of Tool Room Grinding is also available free of charge.



**STATIONARY WHEEL HEAD** and revolving table is the only design that can give you 4 speeds . . . all controlled by a single convenient lever.



**ROLLER BEARING MOUNTING** of sliding table assures long-life accuracy. Note the three slots on swivel table—two angular, one straight—another LeBlond exclusive.

**THE R. K. LEBLOND MACHINE TOOL CO. Cincinnati 8, Ohio**
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

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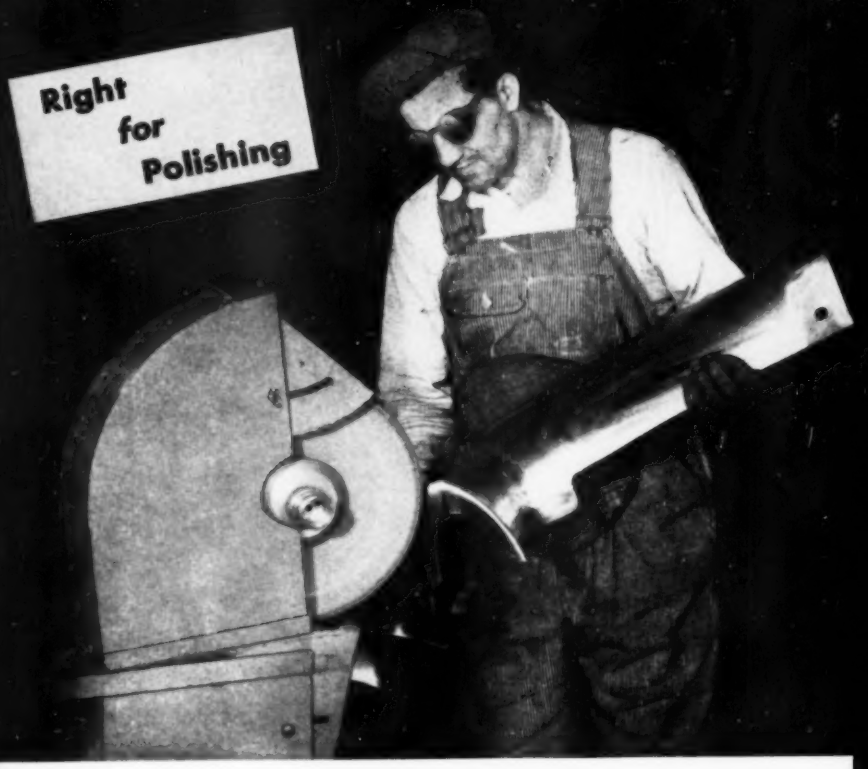
LEBLOND

# Reduce Finishing Costs with ALUNDUM Abrasive!




**ALUNDUM Polishing Abrasive** is available in a wide range of sizes and with special surface treatments to meet the exact requirements of every polishing job. For helpful polishing tips and for full details on cost-cutting ALUNDUM abrasive see your Norton distributor—or write for a free copy of "Setting-up Metal Polishing Wheels and Belts."

**Right for Tumbling**

**ALUNDUM Tumbling Abrasive** is an ideal tumbling medium because—it's **all abrasive** for a continuous cutting action—it's **heavy** for the fast, positive cut—it's **hard and tough** for a long productive life. Contact your Norton distributor for full details, or write for "Precision Tumbling with ALUNDUM Abrasive."

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NORTON ABRASIVES

G-211R

A **BULLARD SPACER** applied to Radial Drills has proved its worth in Savings by eliminating many costly jigs previously required on many drilling operations.

Almost unbelievable operational Savings have also been made.

However, Accuracy is only as good as the accuracy of the Drill to which the Spacer is applied. To assure the Accuracy of which the spacer is capable, Cincinnati Bickford offer their Super Service Precision Drilling Machine.

With a Precision Spindle in the drill, this combination is *Hard to beat* on reproduced Accuracy of hole spacing, drilling, reaming and tapping.

*Installations of this type are proving Profitable investments in numerous plants. Ask Bullard or Cincinnati Bickford about this "Natural" combination.*

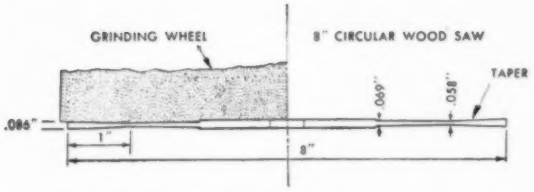
# THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

# Adaptable New Thompson Surface Grinders

# LOWER COSTS

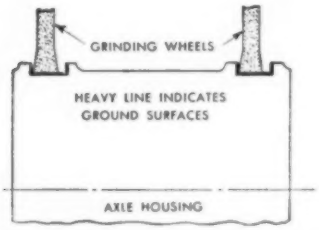
## In a wider range of industrial applications




**TRUFORMING MACHINE GRINDS CIRCULAR WOOD SAWS**

## IN 300% LESS TIME

This Thompson Circular Saw Truforming Machine grinds 8 inch high carbon steel wood saws in 2½ minutes. Formerly this job required 2 operations and 8 to 10 minutes on a circular single chuck grinder. Machine is available in 6 to 12 inch and 6 to 16 inch sizes.

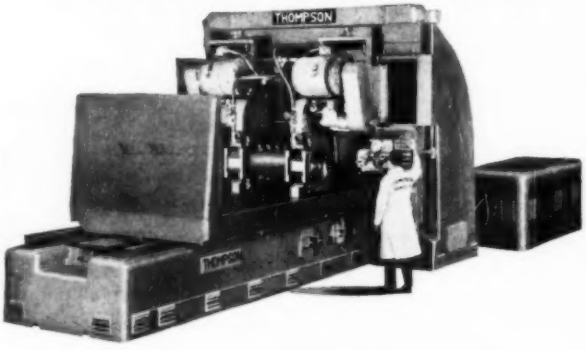



Thompson Hydrail Grinder (widest surface grinder built) reduces finishing time on massive diesel locomotive bearing housings and grinds to a tolerance of .0008" over 72" x 120" area. Machine illustrated is 72" x 36" x 120". In other industrial applications can sharpen large dies eliminating stripping down and assuring that all surfaces will be in correct relation. Horizontal or vertical wheel heads or both available. *Write today for details or other information concerning possible application of Thompson Surface Grinders in your production work.*

**HYDRAIL GRINDER DOES**

## 3-DAY JOB IN 2 HOURS

**ON LOCOMOTIVE BEARING HOUSINGS**




The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

**Thompson SURFACE Grinders**

**The Thompson Grinder Company, Springfield, Ohio**

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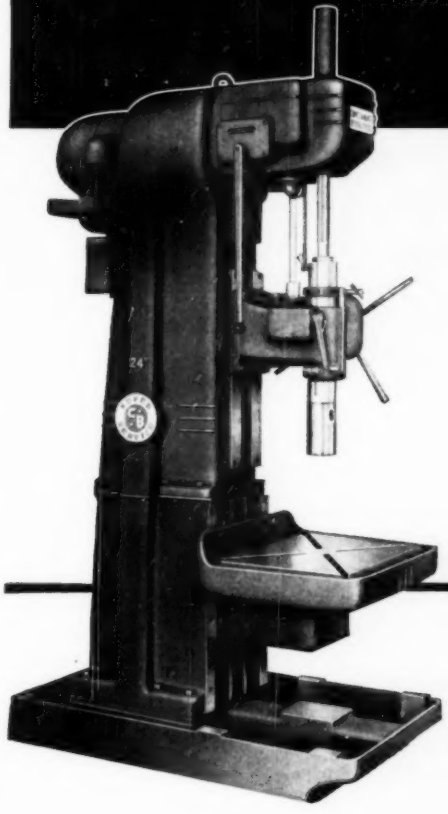
They have the SPEED and ENDURANCE for

# *Automotive Production*

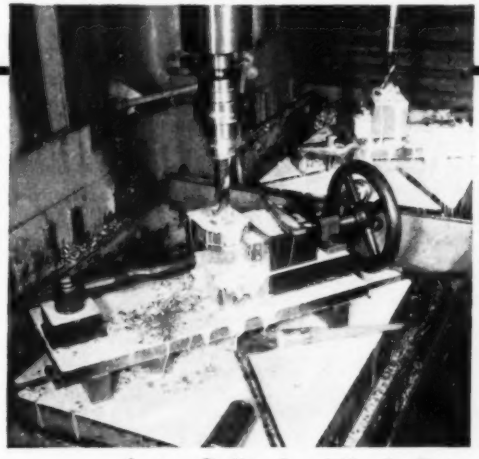


Among the factors which permit long and severe working performance of Bickford Super Service High Production Upright Drills are the direct drive motors, positive type clutch, sturdy gearing, integral keying of all spline shafts, and complete protective enclosure of all mechanism.

Speeds and feeds are easily obtained by the operator. Control levers are at operator's finger tips, and bring rapid and easy operational control.

The close-up shows a Cincinnati Bickford Super Service Upright Drill at work in the automotive industry where production is a must.

Write for Booklet U-27—a complete description of the construction features and capacities of Cincinnati Bickford Super Service Single and Multiple Upright Drills.



Courtesy—The Kaiser-Frazer Willow Run Plant.

Our 75TH Year
CINCINNATI BICKFORD
1874-1949
METAL DRILLING MACHINERY
SUPER SERVICE

*Equal Efficiency of Every Unit*
*Makes the Balanced Machine*

**THE CINCINNATI BICKFORD TOOL CO.** **Cincinnati 9, Ohio U.S.A.**

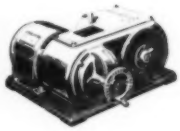
"All that I am I owe to Reeves Speed Control"

## THE 3 BASIC REEVES UNITS

**VARIABLE SPEED TRANSMISSION** for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

**VARI SPEED MOTOR PULLEY** provides an instantly variable speed drive within 4:1 ratio for any constant speed moto. Sizes to 15 hp.

**MOTODRIVE** combines motor, speed varying mechanism and reduction gears in single unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 20 hp.



REEVES Speed Control releases the full capacities of production workers . . . enables operators to vary machine speeds instantly and accurately to match differences in skill or number of workers and to meet the needs of different operations. Results: Faster output . . . higher, more uniform quality of product . . . fewer rejects. Install REEVES Variable Speed Drives on your present machines, and always specify REEVES-controlled machines when you buy new equipment.

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**FREE!** Valuable, new, 16-page catalog, "REEVES Automatic Production Control," covering applications of interest to every industry. Send today for your copy of Catalog No. A20-G487.

**REEVES PULLEY COMPANY • COLUMBUS, INDIANA**

***Recognized Leader in the Specialized Field of Speed Control Engineering***

ACCURATE • VARIABLE
*Reeves Speed Control*
GIVES THE RIGHT SPEED FOR EVERY JOB!

# SPOT NEWS OF METALWORKING

**Standardized drawings and engineering specifications for aircraft engine** production in case of a national emergency are reported being developed by an aircraft engine builder in cooperation with three automobile makers who were subcontractors for complete engines during World War II.

**Automobile theft is made impossible** by a Dutch invention called A.S.A. (Auto-Safe Apparatus), based on the principle of blocking the four wheels by means of hydraulic pressure. When the car is parked, the driver presses the brake and turns a key in a special new lock on the dashboard, which makes the car immovable. Only means of unblocking the car would be by withdrawing the brake oil. Price is $20.

**New use for aluminum** is as an enamel applied directly from its sealed container by compressed air, in the manner of the aerosol bomb insect spray. Freon 12 is the propelling gas.

**Sensational disclosures on smuggling of ball bearings out of Germany** will break soon, involving illegal shipments to eastern countries of bearings used for tanks and other war equipment. Such type bearings are not from current undercover production but from hidden stockpiles. None of western Germany's top bearing producers are involved.

**New Studebaker automatic transmission** is said to have a torque converter that locks out at higher speeds, similarly to Packard's Ultramatic. All of the new automatic transmissions so far announced or rumored will have planetary transmissions, requiring different types of gear cutting machines than is current practice for synchromesh sliding gear transmissions.

**Electric windshield wipers are getting recognition.** Auto-Lite and Bosch now have simplified designs. New California law makes them mandatory and auto makers are now having to add booster vacuum pumps and vacuum storage tanks to present wipers to comply with the law. May be cheaper and simpler to just use electric units.

**Dry lubricants,** first used on steel by the auto companies prior to stamping, will soon be applied at the mills by makers of steel, aluminum and silver alloys. Two types of lubricants are used: One for deep drawing, the other to prevent scratches. Mill applications will avoid use of slushing compounds and prevent rusting in shipment and storage.

**Farm equipment workers** have been put under the jurisdiction of Walter P. Reuther's Auto union by the CIO. This will upset labor relations in some plants because the Farm Equipment Union merged with the left-wing Electrical Workers before being expelled from the CIO.

**Sale of U.S. aviation gasoline and lubricants to Yugoslavia** is a logical step in Secretary Acheson's policy of encouraging more Tito-like defections from Moscow. Look for additional exports of so-called strategic materials to Tito soon. U.S. will even go so far as to ship munitions, and machine tools if this appears necessary.

**Look for ECA to start guaranteeing earnings on know-how investments** and royalties from licensing agreements in Marshall Plan countries. The U.S. Comptroller General handed down a decision to this effect regarding Hercules Powder Co.'s know-how investment in Holland. One hitch: Some cash will have to be put up with these types of investments in order to qualify for a guarantee.

# Gaging Metalworking

**Metalworking operations** are expected to look up during the next few months. The only drawback will be inability to get as much steel as consumers need. Though the steel strike has ended, the ill effects will linger on for some weeks.

Producers of such consumer goods as electric refrigerators and ranges are unable to keep up with orders, partly because of the setback suffered when steel stocks were whittled down to nothing. This situation is likely to continue until late in the winter. Currently one important refrigerator maker is turning out 4000 units a day, five days a week.

A like condition exists in the television manufacturing industry. The recovery from the slump earlier in the year has been so pronounced that today a comfortable backlog of orders has accumulated.

► Record construction of non-farm dwellings, as shown in the chart below, is giving added impetus to the demand for such appliances as refrigerators, ranges and washing machines, many developments including them as part of the total price "package."

### Heavy-Goods Have Orders

Many of the heavy-goods industries are fortified with considerable business ahead. Diesel-electric locomotive builders have good schedules for the next few months. Turbine builders report that they anticipate having on their books within a short time enough orders to insure full operations during 1950 and 1951. Other heavy electrical products are doing very well.

### Machine Tool Demand Up

Machine tool companies say that demand has picked up domestically. Automotive buying has contributed. Ford has placed some tooling for its Cincinnati transmission plant, while Chevrolet and Chrysler also have been in the machine tool market. Wright field has been purchasing large numbers of machines presumably for maintenance of jet engines. The program for a new jet engine of larger size than those now being made is in its preliminary stages. It should involve substantial numbers of machine tools.

► The feeling among machine tool builders is on the "up" side as they look ahead into 1950. The chief uncertainty is what will happen to export sales. Pound devaluation has put U.S. machines at a serious price disadvantage, not only in European countries and Britain, but also in Canada, where the British machine tool industry is preparing to make an intensive drive.

Despite mixed opinions about prospects in Europe, U.S. machine tool builders have been taking a certain amount of business away from builders over there. Orders have been placed by an Italian ball bearing company and sales also are reported to western Germany which is viewed as a growing market for American tools.

### Bolts, Nuts, Rivets Active

Bolt, nut and rivet makers have had an active fall season. The recent swell in volume of new business can be attributed only in part to the steel strike, as every maker of metal fasteners had enough steel on hand to continue operations without interruption.

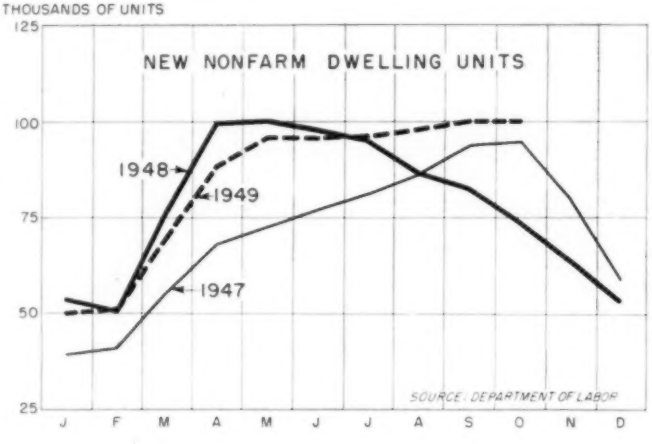
The only disturbing factor is that some shortage of steel for bolt, nut and rivet companies in certain grades of stock may exist into the second and third quarters of 1950. A prime producer of bolt wire and rods, for example, says that at least two weeks will be needed from the time work was resumed until he could make shipments in the smaller and most wanted items. This means that bolt makers face the possibility of curtailed operations during December and January, as their steel stocks are almost depleted.

### Tool, Die Outlook Fair

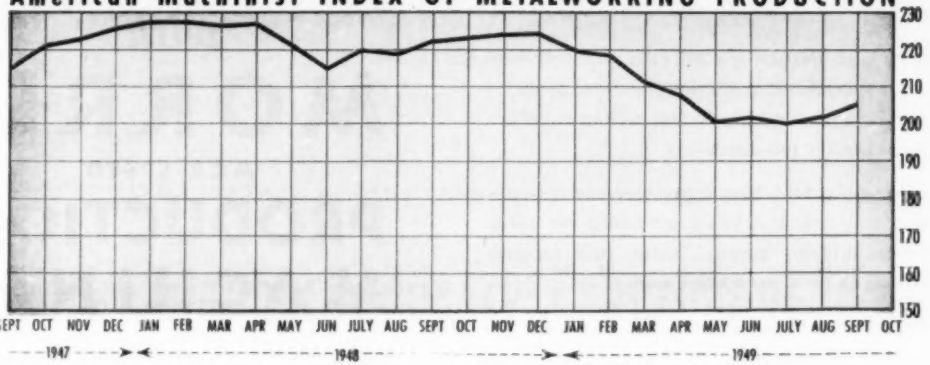
The volume of new orders in September received by contract tool and die shops was good, but the steel strike put a crimp in October business. The outlook up through the

## RECORD NEW HOUSING STARTS MEAN MORE BUSINESS FOR METALWORKING

| Month | New nonfarm units started 1947 | 1948 | 1949 |
|---|---|---|---|
| Jan. | 39,300 | 53,500 | 50,000 |
| Feb. | 42,800 | 50,100 | 50,400 |
| Mar. | 56,000 | 76,400 | 69,400 |
| Apr. | 67,100 | 99,500 | 88,300 |
| May | 72,900 | 100,300 | 88,300 |
| June | 77,200 | 97,800 | 95,400 |
| July | 81,100 | 95,000 | 95,500 |
| Aug. | 86,300 | 86,600 | 98,000 |
| Sept. | 93,800 | 82,200 | 100,000 |
| Oct. | 94,000 | 73,400 | 100,000 |
| Nov. | 79,700 | 63,600 | |
| Dec. | 58,800 | 52,900 | |
| **Total** | **849,000** | **931,300** | |



## American Machinist INDEX OF METALWORKING PRODUCTION




| INDEX | | COMPONENTS | | | | |
|---|---|---|---|---|---|---|
| | | MACHINERY | ELECTRICAL MFG. | AUTOS, TRUCKS | TRANS-PORTATION EQUIP. | OTHER METAL-WORKING |
| Oct. 1949 (preliminary) | 202 | 194 | 194 | 240 | 288 | 135 |
| Sept. 1949 | 205 | 194 | 196 | 247 | 291 | 136 |
| Oct. 1948 | 223 | 250 | 235 | 223 | 311 | 155 |

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

first quarter is fair. New York area shops look with optimism on prospects for the first half of 1950. But the fact remains that business in tools and dies is very spotty. Certain companies are almost devoid of work, while others are running at a normal rate. New England shops are hungry for orders, whereas shops in Cleveland, Chicago, Columbus and Indianapolis have fared better.

### Autos and The Steel Strike

There have been some interesting by-products from the steel strike in the automotive industry. The gray market blossomed forth again. Two weeks after the steel strike started, one auto company was offered 2000 tons of cold rolled body sheets of the proper gage, size and finish.

"Conversion" deals are said to be back again to keep plants going. That means buying ingots from one plant, sending them to a blooming plant and finally to a rolling plant if they could find open time.

► To keep going some purchasers have been welding narrower sheets to get the width they needed for the big dies so common to the industry. This is more expensive but it is understood that the welded sheets are just as sound as the wide sheets, only they cost more and there is more scrap.

Shut downs for model changes may be helpful to many of the car makers because they will have an opportunity to get some steel ahead before their cars are announced in January.

Tool and die work in the Detroit area has had a mild pickup in recent months. As of October, last available figures, a group of 120 shops, including most of the largest ones in the area, had a slight upturn in employment—7,332 men, compared with 7,223 in the spring.

These shops were offering delivery in about 4½ weeks on jigs and fixtures, about the same as in the spring. Gage delivery time still stood at about 2½ weeks. Sheet metal dies were available in about a month, and forging dies in about six weeks. The average tool and die shop was working approximately a 5½-day week.

### Will Pensions Affect Steel Price?

One question being asked is: Will pension plans in the steel industry result in higher prices for steel? Industry observers believe that while there may be price adjustments on some products, an across-the-board general increase is unlikely, at least until next spring.

They base their estimate on these two things: (1) Most of the pension plans don't go into effect until March 1—and the companies will need much of the time before then to work out the details of the plans. Many of them will not know what their exact costs per hour or per ton will be for some weeks yet. Then, (2) the industry will be working at top capacity through the winter months in catching up on orders accumulated during the strike. It is likely to be at least March 1 before the industry can make an estimate as to what the market for its products in late 1950 is likely to be.

### What Pensions Cost

Rough estimates of the costs of pensions for the steel industry work out this way: Depending on how the details of each company's plans are worked out, costs are likely to range between seven and ten cents an hour. In addition, the social insurance plans included in the agreement will add 2.5 cents to the hourly costs of the new program. Total costs of the pension and insurance programs are likely to range between 9.5 and 12.5 cents per hour. With the industry operating at high capacity that would add $2 to $3 a ton to the cost of turning out steel. But—better productivity in the industry and the return of sharp competition are likely to mean that not all of that cost will be passed on to steel users.

### Drop in Index

The AMERICAN MACHINIST Index of Metalworking Production dropped three points in October, although the figures were obtained too late to be traced on the chart above. The new figure is 202, against 205 for September. The drop in automobile production is largely responsible for the decrease, despite the fact that the effect of the steel strike is not yet reflected in the Index. Other declines were in the electrical manufacturing, transportation equipment, and other metalworking components.

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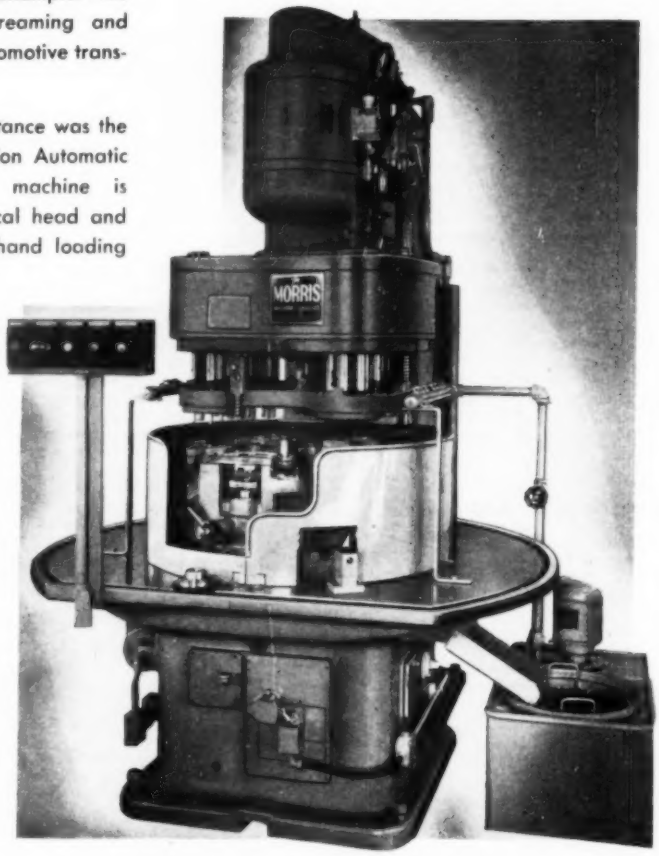
## MOR-SPEED
# PRODUCTION MACHINE•

For the past decade the MORRIS Machine Tool Co. has specialized in the design—development—and building of high production drilling machines to meet specific job conditions.

As a result of this long experience and specialization they are in a position to help you solve intricate drilling, boring, facing and tapping problems on mass production work.

Take the machine illustrated for example:—the job here consisted of drilling, reaming and chamfering steel pump hubs for automotive transmissions.

The answer in this particular instance was the Morris Vertical Hydraulic Six Station Automatic Indexing machine shown. The machine is equipped with a 28 spindle vertical head and six fixtures arranged for double hand loading with automatic clamping and unclamping. A coolant system flushes the work during machining operations.




Production is continuous and averages over 1700 pieces per eight hour day. The operator merely loads and unloads the work at the loading position.

If you are considering high production work requiring drilling, reaming, tapping or similar opreations, it will pay you to consult MORRIS. They have the experience, the engineering "know-how" and facilities to help you.

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CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

# Teacher-Industry Experiment

On October 8 an interesting and unprecedented event took place in New Britain, Connecticut.

The public schools closed for the day and the city's six hundred teachers visited local industrial plants. They inspected all kinds of machines and mechanical operations.

They did more than that, however. At the Stanley Works, they interviewed the company's president and were interviewed by him.

The teachers were unable to get to every plant in one day. But over a period of eight years New Britain plans to have all of its teachers inspect all of its factories.

The experiment proved so successful that school authorities around the country would like to see it extended to other communities. For one thing, the Associated Public School Systems, comprised of a group of some fifty school systems throughout the nation, intend to foster it. The APSS is primarily interested in exchanging information on good educational practices.

Dr. Norton Beach of Teachers College of Columbia University, who is executive secretary of APSS, is emphasizing that the bridge thus built between industry and education must be used for two-way traffic. That is, industrialists will be asked to pay a return call to the schools, wherever the bridge has been built.

Each New Britain teacher, as a result of his visit, is now in effect a part-time vocational advisor to his students. He will possess the knowledge to encourage some pupils to go into one area of specialization; and, on the other hand, to discourage others as a result of an overflow or shortage of certain types of workers.

Dr. Beach is convinced that the teacher will find himself less of "an island, apart from the mainland" after these visits to local industries. He will become part of the economic and industrial life of the community.

Teachers with specialized interests may be invited to make specialized tours to see exactly how their own students fit into industry, and just which techniques are applied on actual jobs.

By means of this program, teachers will come to know something about the problems of industry. What is just as important, industry will learn about the problems of education and vitally aid in their solution.

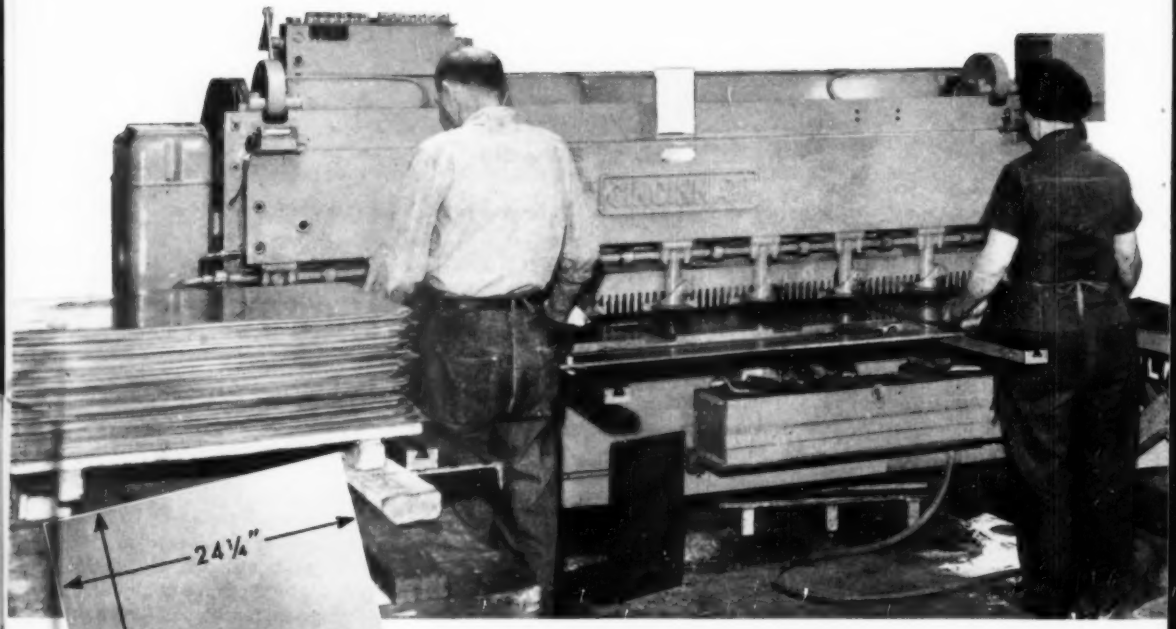
This is a happy idea—the visits of teachers to local industries—which would yield far-reaching benefits. Aside from the features already mentioned, it is a natural and painless way of spreading the word through the community of what industry is doing. For whatever impressions the teachers get will be passed along to their families, friends and pupils.

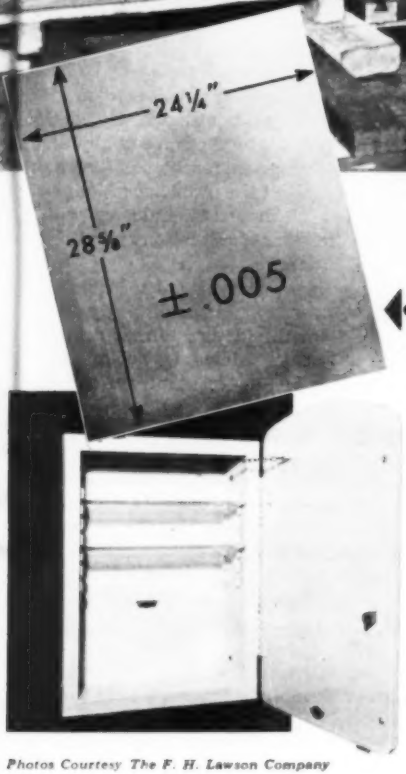
The best thing about the experiment is that it is conducted on the local level. It concerns itself with familiarizing teachers and industrialists with problems affecting the community. For whatever deeply affects local industry, in turn affects the schools and all local residents. And what affects the schools is inevitably of deep concern to local industry.

It is an experiment which we hope will spread rapidly to other cities. What better way is there to win two-way understanding right at home among the people who live and work together from day to day?

Burnham Finney

EDITOR






*Photos Courtesy The F. H. Lawson Company*

**These accurate blanks are held to tolerances of ± .005" on Cincinnati Shears in the shops of The F. H. Lawson Company, manufacturers of medicine cabinets, pails and all sorts of containers.**

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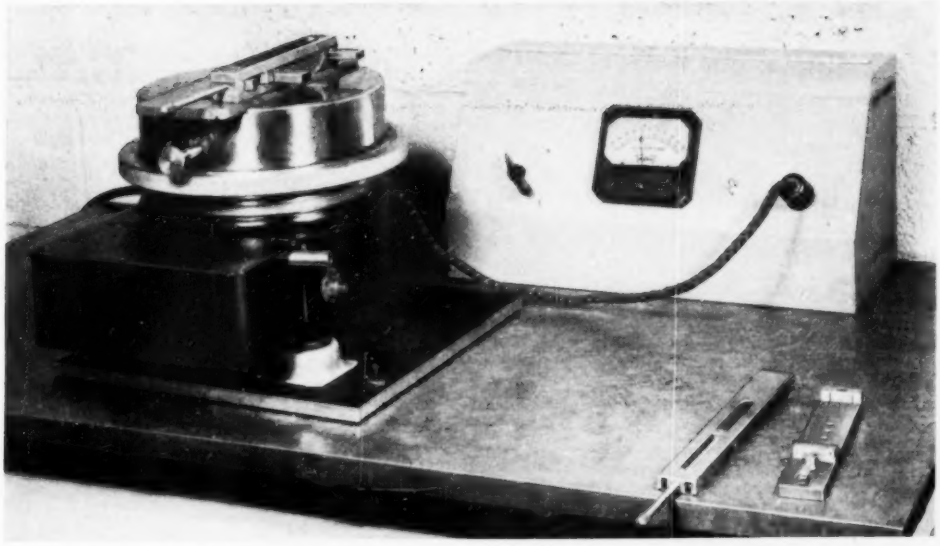


1 *This special electronic gage, really a comparator, proved capable of "repeating" within millionths to a standard. On it is a special clamp for gage-block stacks; two commercial clamps are at right*

# ODD-SIZED HOLES TO MILLIONTHS

**Repeating measurements proves to be the major difficulty, but lab procedure now developed to attain a standard within ±0.000002 and to transfer dimension to a hole within 0.000008**

By E. J. TANGERMAN
Managing Editor, AMERICAN MACHINIST

GROWING APPRECIATION of the advantages of true interchangeability have stimulated increasing competition for refinement between the machine tools to produce accurate work and the instruments with which to measure the product. In the past few years, electric and air gages — which are really comparators — have been refined to such an extent that they can clearly compare dimensions to one or two millionths of an inch. That we have machines or processes capable of achieving such close dimensions is a matter of conjecture —or at least of debate; controlled-process men say "Yes," but production men say "No."

Production men will admit it is possible to mass-produce straight dowels or pins to tolerances in the order of ten millionths of an inch, and that standard gage blocks can be finished to limits as close as one or two millionths. But finishing holes to such close tolerances is something hard for shop men to believe—and finishing of odd-sized holes to such tolerances a practical impossibility.

It is interesting, therefore, to review a series of steps taken recently at the Bryant Chucking Grinder Company, Springfield, Vermont, toward achieving super-precision finishing of odd-sized holes by grinding. We described the machines and special conditions for such finishing two years ago (*A.M.*, May 22, 1947), stressing particularly the attaining of surfaces smooth, straight and concentric to a millionth or less. Recent studies, however, have dealt with the problems of producing miscellaneous holes to

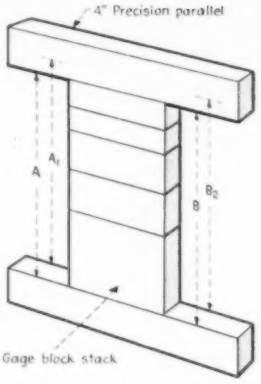
exact dimensions as well as exact finish.

This is really two problems: first to produce a standard measurement of the desired accuracy, second to transfer that measurement conveniently from standard to hole.

### Attaining the Standard

Gage blocks are the core of the metalworking measurement system. Their use as a base reference assures interchangeable parts, even from isolated plants. It is the common belief that if blocks are wiped or wrung together, the ends of the stack will be parallel and the stack constant in over-all dimension. On this basis, the failure of available gages to give repeat readings to a few millionths was assessed to temperature change or "slop" in the gage bearings, etc. But these errors were so persistent that few people dared to claim measurements to this accuracy.

Thus the indicated first step was to achieve a gage without the obvious faults. Bryant engineers produced a special electronic gage—a reed-suspended arm of 5-to-1 ratio carrying a shutter which interrupts a light beam. The resulting change of light is amplified electronically so that a five-millionths-inch (0.000005-in.) movement of the contact point is indicated as about $\frac{1}{8}$ in. on the dial. This unit is shown in several of the photographs; it is a comparator just as an air gage is.




**2** *How to check a gage-block stack for parallelism. Measure at A and at B between precision parallels, at both edges of parallels. Measurements should "repeat," even if the stack is broken and reassembled*

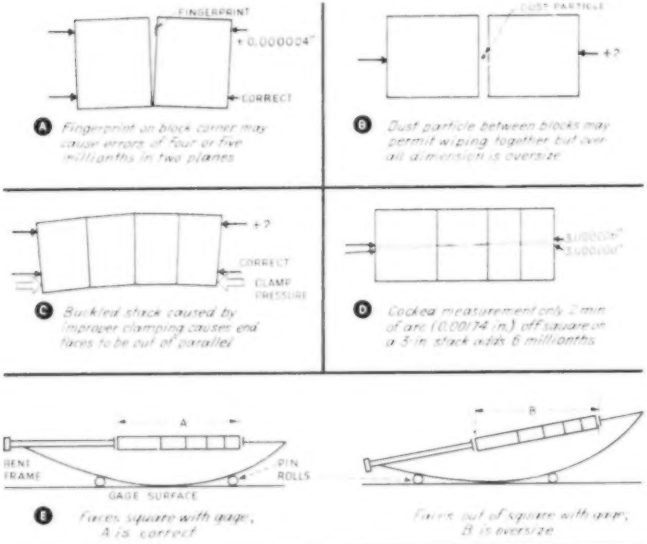
Of course, it is assumed in discussing measurement to this accuracy that the work is done in an air-conditioned room and that block stacks and work are given proper opportunity to stabilize in temperature before measurement after working or handling. Simply handling, or breathing upon, a gage block or work is likely to affect dimensions as much as three to five millionths. Stabilizing temperature in a handled assembly may require as long as half an hour unless gage blocks of the plastic-grip type are used. Work temperature can be held very close to measuring temperature if temperature of the heavy flow of coolant is held constant and lubricant temperature in the machine is similarly controlled.

### First Surprise

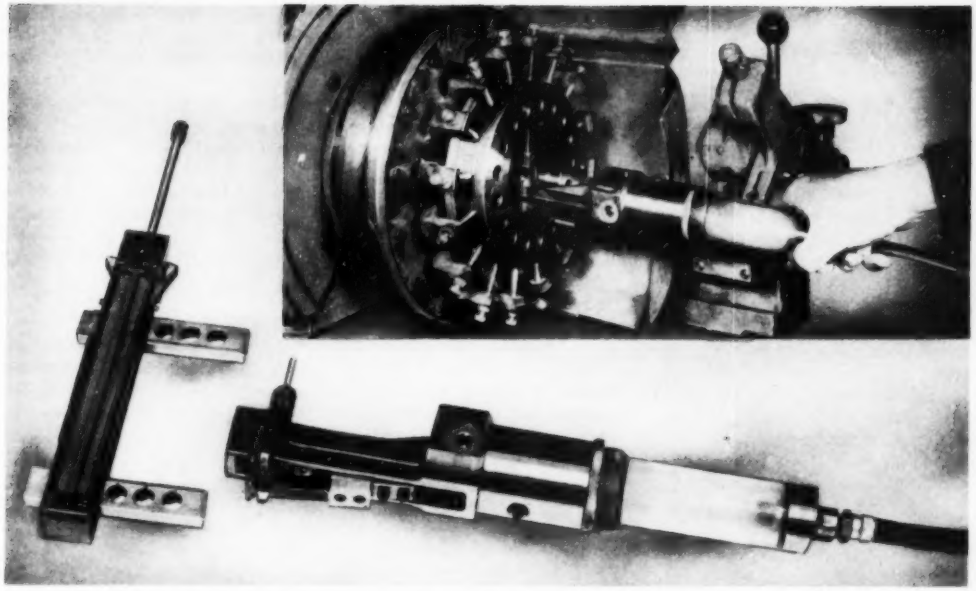
The first surprise in testing gage-block assemblies was that the common beliefs about such standards are not true—when you're dealing in millionths, a stack of grade A gage blocks is only as accurate as you make it. For example, if two clean blocks are separated and *one* corner of the mating face of one block touched with a finger, the reassembled stack will have a face taper of four or five millionths inch. Simply wiping the blocks on the heel of the hand will permit them to be wiped together and is good enough for measuring to tenths, but not for millionths. Unless the blocks are washed with 190-proof alcohol and a lint-free cloth, then assembled immediately and without touching mating faces, stack ends will be out of parallel in one—or even two—planes. This can be shown by plotting readings—repeats at an exact point will repeat. Properly assembled blocks will give repeat readings anywhere on their outer faces on a sensitive gage—indicating that the gage is giving a true reading and that the block assembly is square.

### Second Surprise

Assuming the stack is correctly assembled, the second problem is to hold it—and to hold precision parallels against the ends to attain

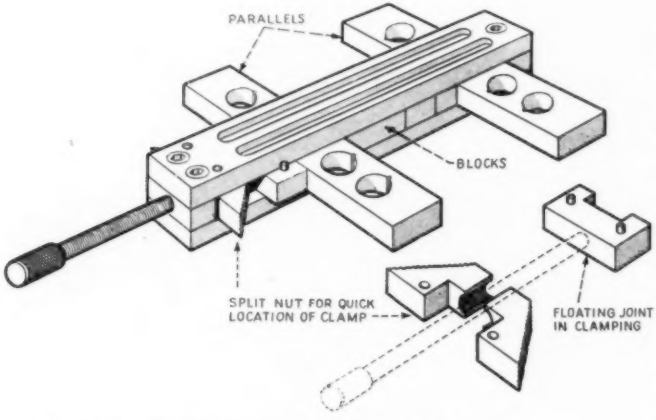

FINGERPRINT
+ 0.000004"
CORRECT
A Fingerprint on block corner may cause errors of four or five millionths in two planes
DUST PARTICLE
+?
B Dust particle between blocks may permit wiping together but over-all dimension is oversize
+?
CORRECT
CLAMP PRESSURE
C Buckled stack caused by improper clamping causes end faces to be out of parallel
D Cocked measurement only 2 min. of arc (0.00174 in.) off square on a 3-in. stack adds 6 millionths
A
BENT FRAME
PIN ROLLS
GAGE SURFACE
E Faces square with gage, A is correct
B
Faces out of square with gage, B is oversize

**3** *Five causes of inaccuracy in reading gage-block stacks to millionths. In all these cases, the blocks are wiped or wrung together, but still can give an inaccurate standard*



4 *Special adjustable air-gage plug, in which air flow is confined between two flat surfaces separated by spring tension. Upper point is adjustable, lower is a fixed diamond point. Locating points flanking the fixed diamond simply aid in centering the head. The special plug is used just as a regular plug would be—the handle is rocked up and down to attain the maximum diameter reading. The gage is calibrated, so the operator can "follow" hole size up the last few millionths, and check for taper at the same time*

an interior standard. Two types of clamps are available, one open on one face like a machine vise, the other a loop clamp of strap steel (right, Fig. 1). The open-face clamp permits buckling of the stack upward at the middle; the loop frame itself springs or bends as in Fig. 3-E. In either case, repeat readings at different points will be impossible. Even though both ends of the parallels may give repeat readings, the reading at the upper edge may not repeat that at the lower. The third source of error is of course that of Fig. 3-E, measurement at an angle to the faces rather than perpendicular to them, easy to do if the stack is tilted.




5 *Gage-block clamp designed by Bryant for precision measurements. It is a heavy-duty unit unlikely to spring*

To correct these conditions, a special heavy-duty clamp was developed, Fig. 5. It has two ribbed sides, with all surfaces finished flat and parallel so a properly cleaned and assembled set of blocks will be flat and present the measuring surfaces at right angles to the line of measurement.

### *Finding True "Zero"*

True "zero" of any stack of gage blocks—the minimum reading—can be established by adding their basic sizes from the certified sheet supplied by The National Bureau of Standards rather than from the "nominal size" on the blocks. Here, for example, are the comparative figures on two setups; on one the difference is three millionths, on

the other six millionths, both undersize, in other words:

| Stack I | | Stack II | |
|---|---|---|---|
| *Nom.* | *Bur. Std.* | *Nom.* | *Bur. Std.* |
| 0.10005 | 0.100049 | 0.1003 | 0.100300 |
| 0.1008 | 0.100799 | 0.1005 | 0.100500 |
| 0.107 | 0.107002 | 0.148 | 0.147996 |
| 0.140 | 0.139998 | 0.149 | 0.148999 |
| 0.300 | 0.299999 | 0.250 | 0.249999 |
| 0.747850 | 0.747847 | 0.747800 | 0.747794 |

The Bureau of Standards figures would be used as the exact dimension of the "zero" setting on the comparator; there may be a plus or minus two millionths error because of rounding off the last place, but if the blocks have been properly stacked and clamped, this will be the total error. Under these conditions, it is even possible to break up and reassemble the stack, and get repeat zeros on the gage—indicating that the errors of the gage and the stack combined are well within the allowable range.

### To Transfer the Dimension

Once a standard base dimension has been attained, it can be set on the gage. The next problem is to transfer that dimension to the piece being finished in the chuck. The part cannot be unchucked for measurement, then rechucked, because of the error caused. Hence a portable or hand gage capable of indicating in the order of millionths must be used. Further, it must be adjustable over a reasonable range if it is to accommodate odd dimensions. Available dial indicators are not sufficiently accurate, and air gages depend upon an exact and expensive plug which is not adjustable.

To solve this problem, Bryant designed and built an adjustable head for a standard air gage, Fig. 4. It is capable of comparing the hole size with the known size established between parallels by the gage-block stack.

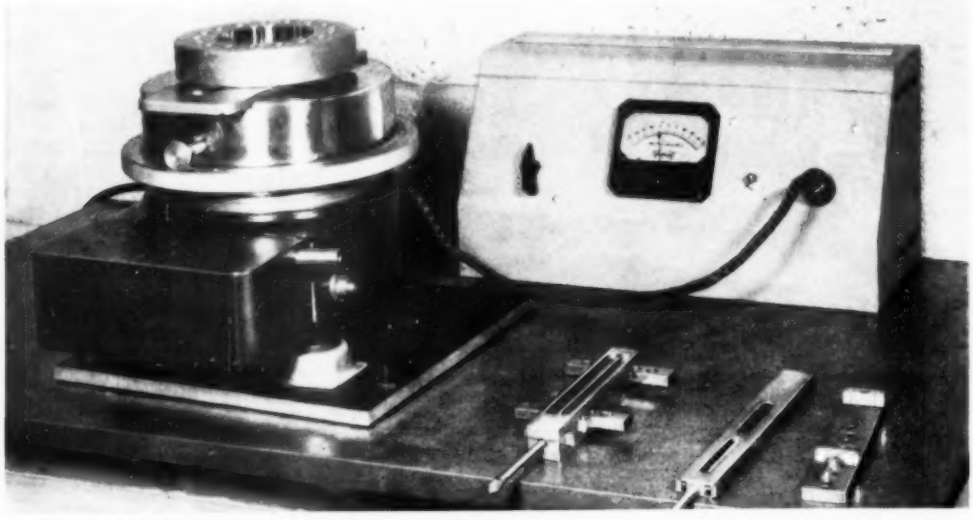
With a conventional fixed-size air-gage plug, air flows between the OD of the plug and ID of the hole. With this adjustable head, the air flow is confined between two flat surfaces separated by tension. Both surfaces float on a common pivot between the fingers of a yoke. One member has a fixed diamond point, the other an adjustable screw. Distance over the two points is adjusted to a standard micrometer caliper for rough size. The head is then brought to zero between the parallels of the clamped gage-block stack.

This gage is a 2-point measuring device—the two locating points on the yoke simply "uprighting" the gage so it will measure on the hole diameter, not the length of a chord. The gage is used like any other 2-point gage, Fig. 4—the handle is moved up and down so the maximum reading for diameter is determined. As the gage is calibrated, the operator can follow hole size right up to the last few millionths and check for taper too.

### Checking the Finished Hole

When the hole is finished to air-gage size, the piece is removed from the chuck and compared with the gage-block standard on the bench gage, Fig. 6, used originally to check the gage-block stack for correctness. The hole may be checked for size, roundness and straightness at the same time (if the grinder is not capable of surfaces to under one microinch rms, the surface roughness will affect diameter readings).

This procedure is still obviously a laboratory setup. It is slow and fussy and cannot, in its present form, be considered a production procedure. It is however, a first step in overcoming problems of precision machining odd-size holes.



6 *Finished holes can be checked against the gage-block stack on the electronic gage. Compare this final measurement with Fig. 1, which shows the stack in place. Roundness, size and straightness can all be checked*

# Simplified System Controls Tool Planning

**Tool classifications and special four-part form ease pre-production planning that supplies tools when they're wanted and at minimum investment**

BY A. C. WEDGE, Chief Industrial Engineer
Ozalid Division
GENERAL ANILINE AND FILM CORP.

SOUND TOOLING is a major factor in the economical manufacture of Ozalid reproduction machines. Yet, in large-quantity production, tooling costs on a single part may run into thousands of dollars. To safeguard its large investment in this important phase of production, Ozalid has developed a complete and flexible tool control system.

Of major interest in this system are the steps taken to insure the availability of tools as new projects get under way. Specific accomplishments in this phase of tool control are: (1) Product design is coordinated with economical tooling and production. (2) Control of tool design and tool production is tied in with the determination of manufacturing methods and tooling requirements, (3) Control of tool availability is coordinated with production schedules. (4) Provision is made for sub-contracting and purchasing of tools. (5) Tool repair and reconditioning is provided so all tools are in good condition when needed.

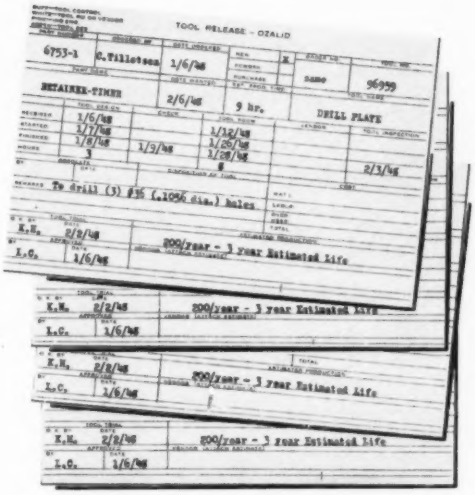
Touching all phases of manufacturing, the system attained its present form after careful trial and examination of results. The original proposal was first drawn up and submitted to a group of all the supervisors concerned with tooling, production and inspection. After discussion, it was revised and put into effect on a trial basis. It was then revised again for complete workability and finally adopted as the composite plan for complete tool control.

### *Tools Are in Three Groups*

At the outset, it was found necessary to classify all tools into three significant groups for identification and processing:

**Standard Perishable Tools**—Small, expendable, relatively inexpensive tools that can be purchased direct from suppliers' stock and are used for machining a large variety of parts. This includes standard drills, reamers, milling cutters, tool kits, grinding wheels, and similar items.

**Standard Non-Perishable Tools** (Relatively Long Life)—Tools that are fabricated or purchased at a significant cost for use on a variety of production or inspection operations on each of several parts.


TOOL RELEASE - OZALID

6753-1 O. Tillotson 2/6/48 same 96999

RETAINER-TIMER 2/6/48 9 hr. DRILL PLATE

To drill (3) #35 (.1095 dia.) holes

200/year - 3 year Estimated Life

**Tool release form** is authorization to manufacture, sub-contract, or purchase new tool or to make major repairs to existing tools. Four-part form coordinates all steps in procuring tool, permits follow-up, and provides record of action taken. Original is master tool control file copy. Pink, green, & white carbons initially go to Production Scheduling, Tool Design, and Tool Shop, respectively, and later return to master file. Same procedure applies to purchased tools. Above form is for special tool for steel retainer

This includes standard punches and dies for punch presses, bending and forming dies for brakes, broaching tools, inspection and production plug and thread gages.

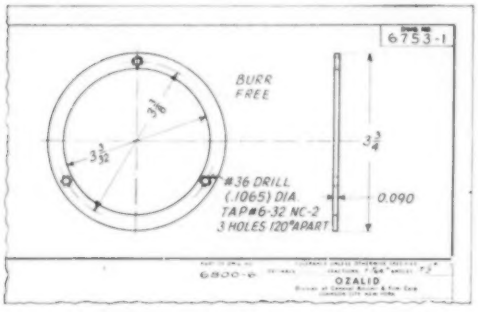
**Special Tools**—Non-perishable, relatively expensive tools, such as dies, drill jigs, special reamers, drills and cutters, form tools; fixtures, templets, and gages, that are made in the Tool Shop, purchased to specifications, or sub-contracted for use on one part or on several specific parts only.

The tool identification system was then built up around these groupings. A sequence of numbers that would not conflict with any other identifying series was selected. Numbers were assigned only to tools in the second and third groups because of the dollar value, life expectancy, and replacemnt factor. As each tool is originated and made available, the tool number is used for the tool drawing, the tool job order, and the tool specification on the operation sheet. The tool number, along with the part number for which the tool is to be used, is also stamped on the

tool itself for identification in the shops and in the toolcrib.

Tools in the first group were set up for control by the toolcrib on a maximum-minimum basis and are identified by standard nomenclature, such as #36 drill, 6-32 NC-2 tap, and so on.

To make information on standard non-perishable tools readily available for planning production of new parts, lists were made up for punches and dies, brake dies, plug and thread gages. Another aid to quick processing was established by assigning the even digit numbers for production gages and the next following odd series digit to the mating inspection tool. Thus, only one number need be found.

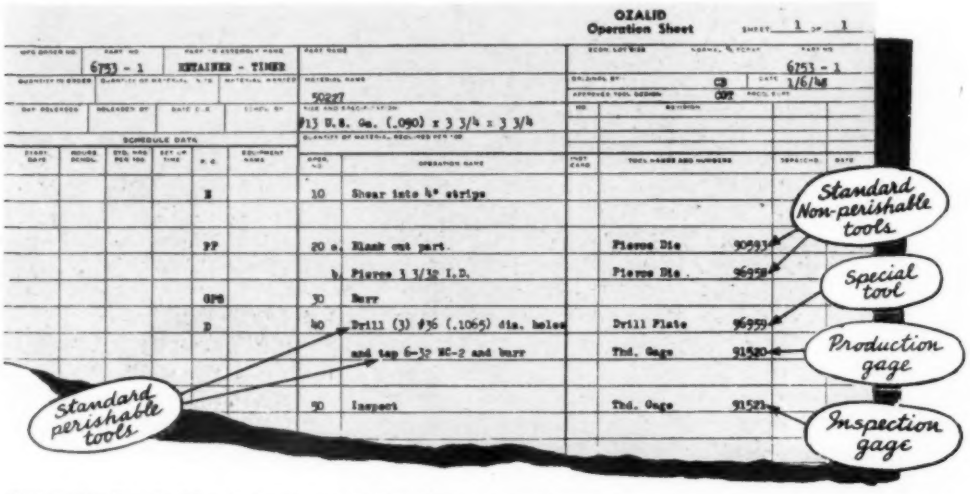



**Steel retainer** is manufactured in small quantities. Most tools specified for this part are standard, as cost of combination die could not be justified

### Tool Men Review Part Design

Initial step in the manufacture of a new product is the machine and part design. In addition to sound functional design, the engineer should give due consideration to simplification of the part for ease of production, low-cost tooling, and low unit production cost. This may be done by the designer himself if he is sufficiently familiar with tool design; by group consultation with the tool designer, tool analyst, and operation sheet writer; or by a preliminary design release. This preliminary release is made on "maroon-line" whiteprints, to distinguish from "black-line" production drawings, is routed to the operation sheet writer and the tool analyst for review and comments, and then is returned to the product designer. Any suggestions that are readily agreed upon for simplifying tooling and production are included in the design and the final drawing is released. In the event of a major change, a group discussion, including the chief engineer, chief industrial engineer, and others, may be held to reach a final decision.

Upon receiving the drawing, the operation sheet writer and the tool analyst determine the type and sequence of operations and the tooling requirements. Standard or interchangeable tools already available are specified wherever possible to eliminate the need for additional tooling expenditures and possible production delays. The operation sheet includes complete tool designations for standard non-perishable or special tools. Standard perishable tools are not itemized but their use for production




**Master operation sheet** for steel retainer is written when part drawing is released from design section. Standard perishable tools are specified by standard nomenclature and are available as stock in the toolcrib. Standard non-perishable tools are specified by number from standard tool list and are available for the manufacture of several parts. Special tool is for "this part only" and is not yet available. This tool required assignment of tool number and issuance of paperwork for procurement. Production gage carries even digit number and mating inspection gage, the next odd digit number. Duplicate tools are ordered in line with production requirements

of the part is indicated in the description of the operation. For example, operation 40—"drill (3) #36 (0.1065) dia holes and tap 6-32 NC-2" indicates that this standard drill and tap are needed.

If tools are available, their numbers are selected from the list of standard non-perishable tools and are added to the master operation sheet. To complete the tool record, the *part number* is entered on the master tool control card—one of which is on file for each tool in existence (Buff copy, Master Tool Release)—and the tool number is cross-referenced to the part and tool index card which has previously been made out for the newly released part.

The tool analyst also determines whether the additional requirement places too great a demand on existing tools and therefore requires duplicate tooling. In the case of standard perishable tools, he advises the toolcrib of abnormal increases in requirements so adequate inventory provisions can be made.

PART AND TOOL INDEX CARD

Part Name Retainer - Timer Part No. 6753

| Tool No. | Tool Name | Remarks |
|---|---|---|
| 90993 | 3-3/4 Dia. Die | Std. |
| 96998 | 3-3/32 Dia. Die | Std. |
| 96959 | Drill Plate | Special |
| 91520 | 6-32 NC-2 Thread Gage | Prod. |
| 91521 | 1-32 NC-2 Thread Gage | Insp. |

**Part and tool index card** is made out for each newly released part and lists all tools required for manufacture. Card provides cross reference with master tool control card, on back of which is listed all parts for which tool is used

### *One Form Controls All Tool Procurement*

If the part requires tools not currently available, the tool analyst assigns a new tool number from the master list and issues a tool release form. This release is the authorization to build, sub-contract, or purchase standard non-perishable or special tools. It also serves for major rework or repair of existing tools. Copies are routed as follows:

**Buff Copy** (heavy stock)—Held in visible card cabinet as a permanent master tool control record. Complete information is added as the tool progresses through Tool Design, Tool Shop, and Tool Inspection and as changes are made during the life of the tool.

**Pink Copy**—Sent to Production Scheduling for assignment of due dates in accordance with the parts production schedule. Copy is returned to the tool analyst, who transcribes this information to the master tool control copy, schedules the tools to the Tool Shop, and then sends the pink copy to the toolcrib as advance notice that this tool will be received at a later date.

**Green Copy**—Sent to Tool Design with the due date assigned by the tool analyst, as authorization to proceed with the tool design according to the due date listed. Upon completion of the tool design, this copy is returned with a print of the approved tool drawing to the tool analyst.

**White Copy**—Sent to the Tool Shop along with a copy of the tool drawing, part drawing, operation sheet, and a copy of the tool order. To indicate acceptance of the tool order and the due date listed on the release, the Tool Shop foreman initials and returns the white copy to the tool analyst.

Simultaneously with issuing the tool release and tool order to the Tool Shop, a copy of the tool order is issued to Cost Accounting for posting of labor and material costs and determining the total cost of the tool when the job is completed.

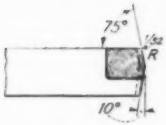
Upon completion of the tool or receipt of the tool from the outside vendor, it is delivered to Tool Inspection along with sample parts, if available, from the tool trials; upon acceptance, the tool is sent to the crib for storage. The crib attendant notes the stock date on the tool release (pink copy) and returns it to the tool analyst, who in turn sends it to Production Scheduling, as notification of the final availability of the tool for production.

Each copy of the tool release by the information contained thereon and by the designated routing serves several functions: as authorization to take action; as a follow-up while work is in process; and as a record of the action taken. All copies of the release are made up when the need for the tool is determined and thereafter provide complete information as to what is taking place. This information is essential both for current administration and for a permanent historical record.

When tool designs, standard non-perishable or special tools are to be purchased, or subcontracted, the identical procedure is followed. The outside tool designer, shop, or supplier is considered in the same manner as if the work were to be done in the plant. The tool release form may be so indicated in the space provided and special notation can be entered in the remarks column.

To control miscellaneous repair and maintenance jobs, open tool work orders are issued each month against each production process center. These open orders are used to accumulate all labor, overhead, and material costs for minor repair, sharpening, and general maintenance of tools. When the work orders are closed out each month by Cost Accounting, they are available to the production foremen for reviewing the monthly charges for work performed.

The plan therefore coordinates all activities required to provide new tools and to maintain existing tools; to make full use of available tools, yet control tool inventories to avoid "stock out" or overloading as new requirements are added; to keep a permanent historical record of all pertinent information; and to organize tool records such that information is readily available for planning as new machines come off the drawing board.




**Carbide-tipped tools** will readily machine Hastelloy alloy D, which is the hardest of this group of corrosion-resistant alloys. OD of flanges and joint faces on these valve bodies are machined at 32 fpm with a 0.009 in. per rev feed, and a depth of cut of 1/32 to 1/16 in. Job is done on a 20-in. engine lathe, and tools tipped with No. 883 Carboloy last for 1 to 2 castings per grind. Until recently, this material could be machined only by slow and costly grinding.

# HARD, TOUGH ALLOYS CAN BE MACHINED

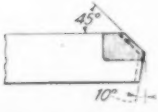
**Ordinary turning, boring and drilling operations can replace costly grinding for heavy stock removal on high-temperature alloys**

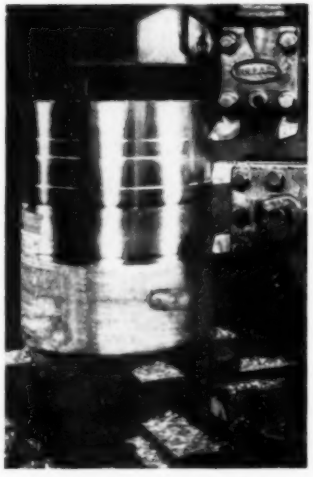
BY FRED B. SILLS, Supt of Finishing Dept, HAYNES STELLITE CO.

MACHINING the hard and tough alloys, especially those in the groups commonly referred to as high temperature, corrosion- and abrasion-resistant alloys, until recently has been considered impracticable, if not impossible. Previous practice on materials such as the Hastelloy nickel-base, and the Stellite cobalt-chromium-tungsten alloys, has been to machine almost entirely by grinding. This has not only been costly, but has limited the finishing to simple operations.

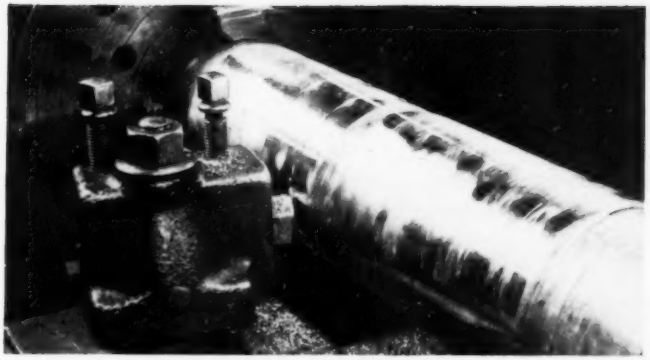
Improvements effected by machine-tool builders, and by manufacturers of cemented-carbide cutting tools, have removed the myth of non-machinability as applied to these alloys, both in the form of castings and as hard-faced deposits on steel backings. They are now being drilled, turned, faced and bored without too great difficulty and with the same confidence as would be shown when machining steel. Usually the necessary finishing is accomplished by machining with tungsten-carbide-tipped tools to leave only 0.030 to 0.040 in. of stock for finish grinding.

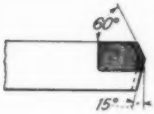
Considerable development work in machining practices for Hastelloy and Stellite has been done in recent months in the Kokomo plant of the Haynes Stellite Co. With present-day machine tools and properly designed carbide-tipped cutting tools, the difficulties experienced when machining these alloys have been largely eliminated and standard practices have been developed for most of those now in use. Typical operations now being performed in the Kokomo plant are shown herewith.



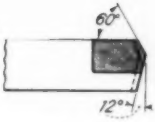



**Steel Sleeves** faced with ¼ to 5/16 in. of No. 1 grade Stellite are machined with single-point tools tipped with No. 883 Carboloy. Depth of cut varies from 3/64 to 1/16 in. Speed is 25 fpm, and feed is 0.012 in. per rev. First tool roughs the irregular surface, second tool in same side-head holder brings part into round, and third tool semi-finish turns, leaving 1/32 in. stock for grinding. Tools have no top rake. Side and front relief angle is 5°. Nose is radiused slightly. Roughing tool life is 1 cut per grind; finishing tools, 1 to 2 cuts






**Pump plungers,** 52 in. long, hard-faced with grade 1 Stellite to a depth of 3/16 to ¼ in. are turned with single-point tool tipped with No. 883 Carboloy. Turning is done at 41 fpm, with a feed of 0.011 in. per rev. Because of the length of the part, tool life averages 1 cut per grind. Production has been increased by turning and then grinding, instead of removing all excess stock by grinding as was done previously. Cutting tool has no top rake. Side cutting-edge angle is 60°, end cutting-edge angle is 15°, and nose has a slight radius




**Pump sleeves,** faced with Hastelloy alloy B, are machined on a No. 1-A Warner & Swasey in 1 pass, using 3 tools. Speed is 41 fpm, and feed is 0.011 in. per rev. First tool has 5/16-in. depth of cut to bring casting into round, second tool takes ⅛-in. cut, and third tool takes 3/32-in. cut for finishing, leaving stock for rough and finish grinding. Tools are tipped with No. 883 Carboloy, and soluble oil is used as coolant

## How to Heat-Treat Chisel Steel

CHISEL STEEL is one of the best grades for tough jobs where the material must take a lot of hard pounding. Yet many toolrooms have failed to obtain good results because the steel is not heat-treated properly. Steel manufacturers always furnish hardening data, but most heat-treat men and toolmakers disregard it.

I proceeded thus:

First I ordered some pea-size charcoal and made a vessel by welding an old piece of 8-in. pipe to a ¾-in. plate at one end. I filled the bottom of the vessel up to a height of about 4 in. with charcoal, then put in the punch to be treated. If more than one piece of steel is to be hardened, I add a layer of charcoal between each piece of steel and am careful to keep any of the steel from touching the side of the steel pipe. A 4-in. layer of charcoal is piled on top.

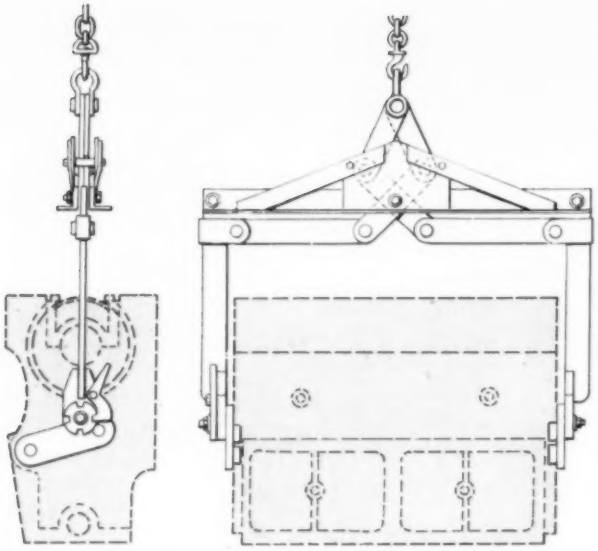
If an electric furnace is available, both the vessel and furnace are started from a cold condition with the furnace set at 2 kw per hour. The furnace should run at this speed up to 1250 F and the material should soak at this heat until it has been thoroughly penetrated.

When the preheating cycle has been completed, the furnace should be set at about 6 to 8 kw per hr until the furnace reaches 1750 F. The steel should soak 30 to 45 min at peak heat. After soaking, the steel can be removed and quenched in clean oil at 160 to 180 F. The final hardening draw should be taken at 450 to 900 F, depending on the job.

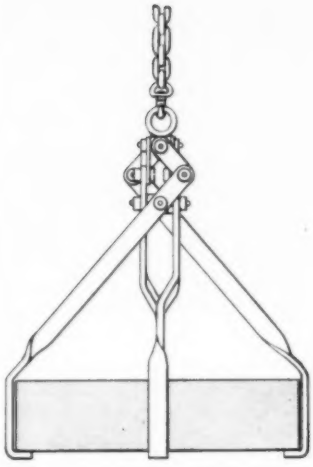
This procedure produces a hardened surface that is about 1/16 in. deep with a really tough center that will not break down or crack under the most severe conditions. Blanking dies, piercing punches, swaging dies, forming dies, arbors, boring bars and special shafts can be produced in a similar manner. However, this steel should not be used for deep-draw dies.

If the steel must be hardened in a gas furnace, two of them should be used, if possible. One should be set at about 1250 F for the preheating cycle, and the other should be set at 1750 F for the final high heat.

The time element in hardening is all important when dies and punches come back from the hardening room all warped out of shape. The only answer is poor handling of the steel. Commonly this is caused by bringing the steel to peak heat too fast. *Arthur Walten, Kenosha, Wis.*

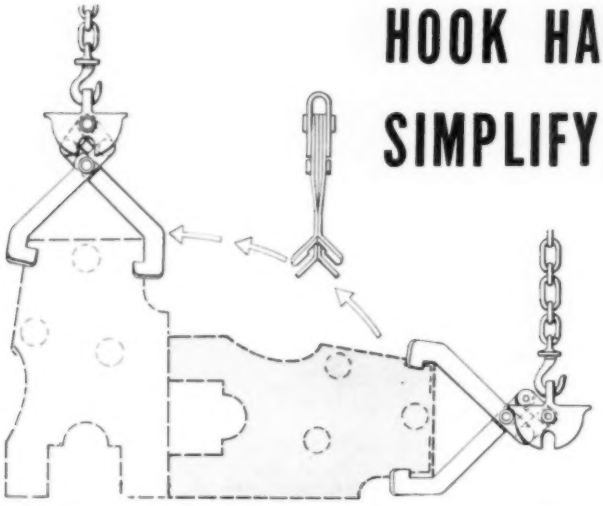


**Turnover grab** for Diesel-engine blocks has two pivoting end plates with plugs that fit in cored holes in the castings. Central links support plates and force plugs into holes while heavy upper bracket pivots vertical links. One end plate carries notched disk, which is engaged by lever-arm tooth in any one of four rotational positions



**Lazy-tong interlocking grab** has four arms that must act at once. Two square pivot spiders link arms to hoist hook. When one set spreads, the other must also. Grab lifts large billets to vertical boring mill; prevents tilting

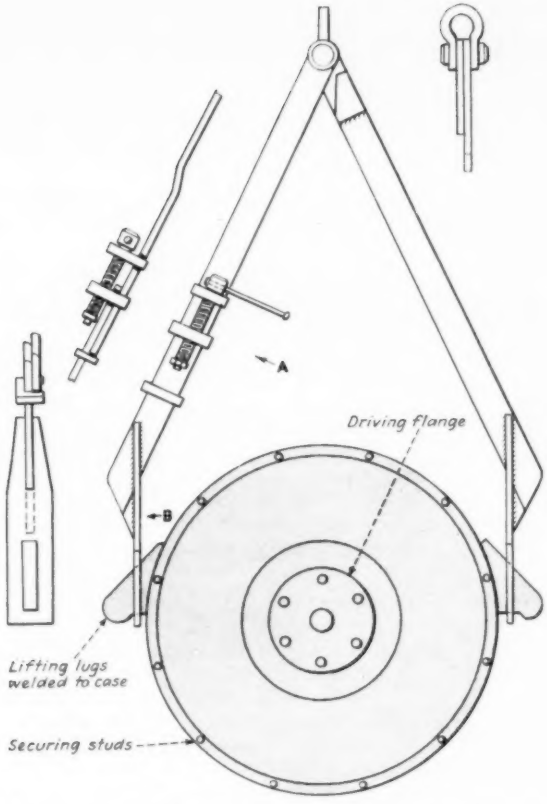
# HOOK HANDLERS SIMPLIFY HEAVY LIFTS



**Self-locking grab** for tilting cylinder blocks can only be opened when block is vertical. Slot in shackle plate allows jaws to be spread as pivot pin goes up into it. Cylinders are grabbed when vertical, tilted down one side for machining on the face, then tilted back upright again before grab can be removed

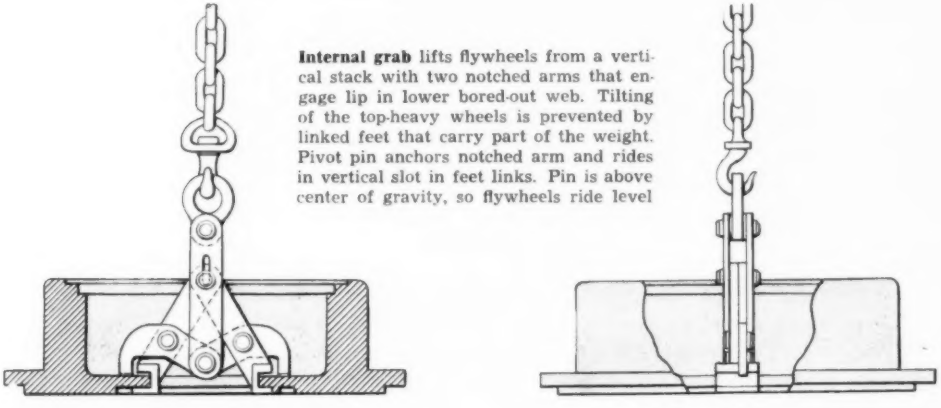
BY R. B. WOLVERHAMPTON

LIFTING and handling equipment, made to work from shop hoists and cranes, can be designed to do more than just lift heavy parts, tools, and fixtures. Workpieces too weighty to be jockeyed around by two or more workers can be rotated, turned over, turned 90°, or adjusted to a given position if the lifting equipment includes a few simple extra principles for versatility.




**Jacking rig** with notched jaws catches lugs welded to generator casings at center of balance. Twelve securing studs in end face of generators are matched with holes in power-unit clutch housings by turnbuckle action of left-hand arm. Bolt shortens or lengthens arm to rotate casings slightly so studs line up with holes

**Rotating lifter** picks up heavy gear wheels and turns them over. Pivot studs are extended in toward gear teeth where they engage roots of teeth to prevent sideslip. Gears can thus be picked up from either flat or on-edge position



**Internal grab** lifts flywheels from a vertical stack with two notched arms that engage lip in lower bored-out web. Tilting of the top-heavy wheels is prevented by linked feet that carry part of the weight. Pivot pin anchors notched arm and rides in vertical slot in feet links. Pin is above center of gravity, so flywheels ride level

# ROUND TABLE

## Are Promises Made To Be Broken?

"Why all the grumps, Ed?" asked Al, "You look as though you're chinning the curb."

"You would too if you had wasted as much time as I have talking to applicants. You know that new man I hired the other day—well, after settling matters I asked him point-blank if I could depend upon him to stay after he started—you know the other two fellows I hired worked a few days, then pulled out."

"Well, Ed, that's the chance you always take when you hire a man—they're not obligated to stick if they don't want to."

"But, Al, this fellow promised me that he would —I told him about the other men and he agreed with me that it was not right to go to the trouble of taking a new man on, then have him pull out after just getting started."

"Sounds like the good old days when you and I used to see how many jobs we could hold in a month—remember?"

"Well, that's beside the point," frowned Ed. "When a man promises me that he'll stick I expect him to keep his word. But now he's pulling out too."

"Are you sure you're right in extracting such a promise from a man?"

"Why not? Surely a man ought to know something about what he intends to do."

"Can you conscientiously promise a man that he'll have a steady job? One can never tell when it will be necessary to lay a man off on account of lack of orders. Did the fellow give any reason why he found it necessary to go back on his word?"

"Yeah; said that he was offered a better job—told me that he had applied for a job some weeks before and that they would keep him in mind, but he interpreted it to mean that his name would be placed on file."

"Well, we both know what *that* usually means. I know how it must make you feel to have the man go back on his word, Ed, but there are extenuating circumstances in this case—the man has to look after his own interests, you know."

"Well, I'll tell him a few things when he comes in for his separation interview, you can bet your sweet life."

"You're looking at things too narrowly, Ed; why not chalk it up to experience and wish the guy good luck on his new job?"

***IS A PROMISE TO STAY,*** *extracted during a hiring interview, valid? What can be done to keep men on the job, or to determine for sure if they're drifters? Your opinions and ideas on this subject will interest others; discussions of earlier topics appear on later pages.*

# MOLD BUILDINGS TO YOUR NEEDS

**Walls won't stretch, but buildings can be adapted to suit production requirements. Here is what Westinghouse did to produce transformers in a building formerly set up for Liberty-ship engines**

BY GEORGE K. KIMBALL,
Equipment Supervisor
WESTINGHOUSE ELECTRIC CORP.
Sunnyvale, Calif.

THE tremendous demand for industrial and central station electrical and steam-turbine equipment throughout the Western United States and the Pacific Basin after the war prompted the Westinghouse Electric Corporation to seek expanded production facilities in that area. Faced with the same opportunity, many companies considered expansion only in terms of new construction. Westinghouse studied such a step, too, but knew of a large existing plant which it believed could be converted to meet production requirements.

Weighing the new-versus-existing-plant problem, Westinghouse decided on the latter as offering a good - as - new plant — most of it erected and tooled since 1940—that would enable speedy conversion and hence would make possible more rapid attainment of production and earlier delivery of badly needed apparatus. Accordingly, the Sunnyvale plant of the Joshua Hendy Iron Works was acquired and the work of reconversion was begun.

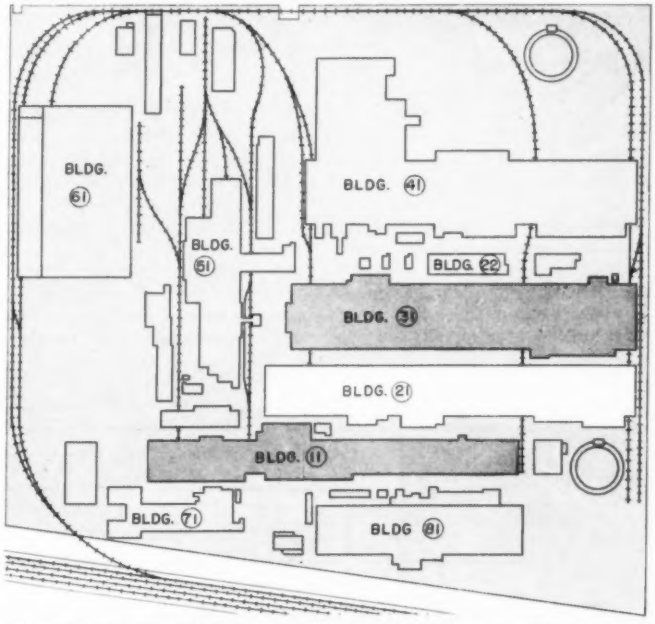
Many of the buildings—two large machine-shop structures, for example—could be put to work immediately, with few changes. It was obvious, however, that other buildings would require major alterations. Although varying reconversion problems were faced in all buildings, those found and solved in Building 21 may be taken as typical.

During the war, parts for large reciprocating steam engines for Liberty ships were machined in the building. This activity has little in common with electrical equipment production, yet many features necessary to the manufacture of electrical apparatus were already present in the structure.

Housing approximately 124,000 sq ft, Building 21 has three bays that extend its entire length of more than 900 ft. The center bay, 52 ft wide and 38 ft high, is flanked by bays 38 ft wide and 27½ ft high. Production selected for this building was mainly large power transformers and smaller types, better known as distribution transformers. The former are virtually "tailor-made," while the latter lend themselves admirably to production-line techniques.

### *Favorable Conditions Existed*

For transformer production, well-lighted areas are particularly important as the winding of coils is an exacting task which requires keen vision. Natural light in Building 21 is normally excellent at most times of day and throughout most seasons. But where natural




**Westinghouse Sunnyvale plant** has more than 1,000,000 sq ft under roof and 57-acre site still has room for further expansion. Building 21, more than 900 ft long by 128 ft wide, recently was converted to transformer production. Its location between buildings 11 and 31 is ideal, as 11 is a warehouse and 31 has large-capacity cranes. Material flows into 21 from 11 and very large units can be moved to 31 for completion. Tracks ease the movement of heavy loads

light is insufficient, arrangement of the building enables installation of effective luminaires to provide adequate artificial light to boost waning daylight levels.

The three-bay arrangement also was excellent for production requirements. One low bay was suitable for the winding machines, materials, and operations in the manufacture of distribution transformers. The other low bay, with its necessary craneways and open space, was a good location for the larger coil winding machines used in the manufacture of power transformers. The high center bay with its numerous cranes was readily adaptable to handling large power transformers from their early assembly stages—tank, coils, bushings, and other parts—to testing, loading, and shipping. The two heaviest cranes in this area have a capacity of 25 tons each. The largest-size power transformer currently built there is the 5000-kva, 69-kv, 3-phase type. Without oil, it weighs about 45 tons. Thus it can be handled easily by the two cranes operated in tandem.

### *Flexibility Is Present*

If it should become desirable to manufacture larger transformers, the units could be built in Building 21 up to the point of final assembly, then transferred to adjacent Building 31 for assembly and shipping. This nearness to other buildings is another reason why Building 21 was selected. The distance to Building 31, with its larger crane height and capacities, is only 40 ft, and shuttle tracks connect the two buildings to facilitate handling of large units. On the other side is Building 11, a large warehouse structure, only 60 ft away, and also connected by shuttle tracks.

Convenient access to Building 11 was important to planning, because transformer production requires a continuous flow of materials. Another feature of Building 21 was also important in this regard. The northern end of the structure, comprising about a fifth of the total floor area, is elevated about six ft. Its main opening door is opposite a similar door in Building 11, and it is planned eventually to install a conveyor system feeding directly between the two structures. This elevated area at one end of the building is the location for the "Insulation Detail Section." Raw material, such as uninsulated wire, copper strip, cardboard tubing, paper and insulation material, is received here and prepared for use in transformer coils. The elevated location provides for a convenient gravity feed to adjacent storerooms in which are kept reels of insulated wire plus pallets or hoppers containing various smaller items.

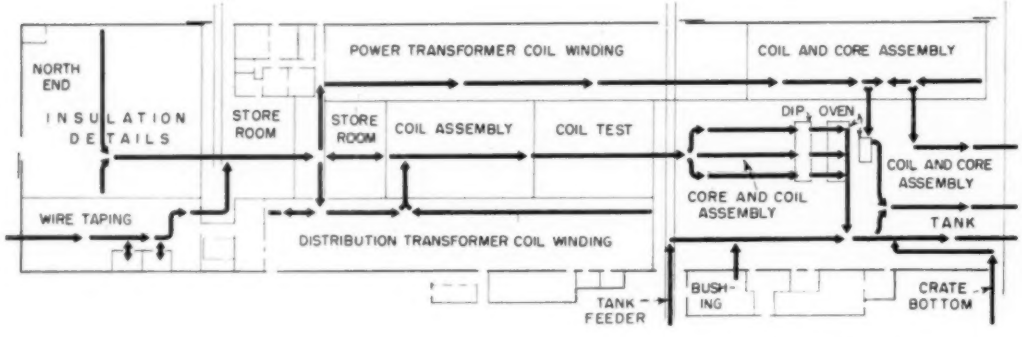
### *Modifications Were Required*

So far, discussion has concerned mainly the pre-existing favorable factors in the building which contributed to our selection of it for electrical manufacturing. *However, it should be emphasized that production was not planned around the building. The need was to adapt to requirements the building which most nearly suited them.* If existing facilities happened to "mesh" with our needs, so much the better, and of course full advantage was taken of them to save time and money.

Actually, there were many major modifications which had to be made. Although some of the concrete foundations for heavy equipment were suitably located, many more were needed. A big job of resurfacing the floor had to be done, as the existing floor consisted mainly of irregular levels of black top or asphalt surfacing. In one section of the building alone, it was necessary to put in about 5,000 sq ft of concrete flooring. Also, many pits had to be filled in, and others, more suited for needs, had to be made.

It was also found necessary to block off some doorways, create new ones, and enlarge others to provide for the movement of materials. For example, the main railroad entrance in the south end of the building had to be increased in height by some 8 ft to provide the necessary clearance for shipping large power transformers. Some doors were blocked off, because of the installation of storerooms, and a new doorway was installed to provide better access to the insulation department.

It was necessary, also, to interchange and add many small bridge cranes and jib cranes, and to relocate high-bay bridge cranes. Other installations included extensive roller conveyors, networks of pipe lines to carry transformer oil to the required points, steam generators for supplying heat to the



vacuum and oil tanks, and large storage tanks for the oil.

### Power Generation Is Apart

Perhaps the biggest single change, however, was occasioned by the greatly increased electrical power requirements. This power is needed mainly to test transformers. For high-voltage generation, a place was required which would be clean, fireproof, and apart from the main manufacturng area for reasons of safety. Also, the motor generators are somewhat noisy, and it was desirable to keep the sound from distracting the workers.

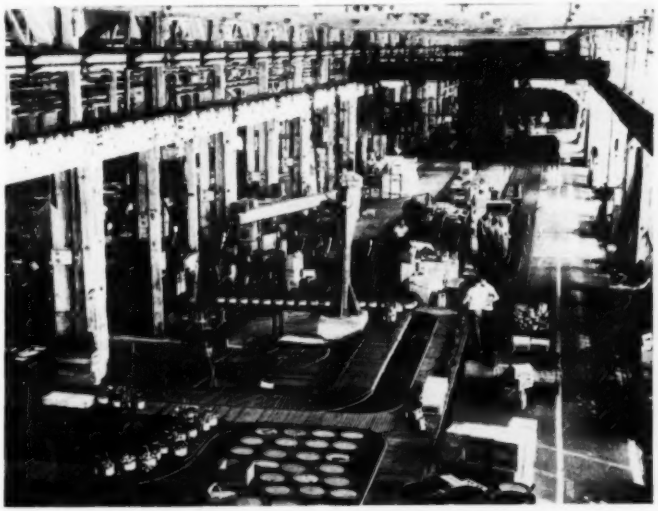
A sturdy concrete room, which adjoins the building and was formerly used as an impregnating and baking shop for generator rotors, proved to be ideal for housing the power-generation equipment. Sealed off by a fireproof door, it now contains various motor generators, the main transformer for the test floor, and remote-control power switchboards which are operated magnetically from the test floor. An operator in the main part of the building has complete control over the power generating room. Underground trenches carry high-tension wires from this room to various outlets on the test floor.

Before the required conductors could be brought into the main part of the building through conduits located underneath the floor, it was necessary to have the whole floor carefully planned. The final layout was the result of many different ideas and suggestions which were sought from every possible source. People from time study and plant engineering departments in Pittsburgh, engineers from eastern plants—particularly from the big transformer plant at Sharon, Pa.—foremen and supervisors from the various Sunnyvale departments, and the workmen themselves, all made valuable contributions. Wherever possible, advantage was taken of plans and procedures which had proved successful at the Sharon plant.

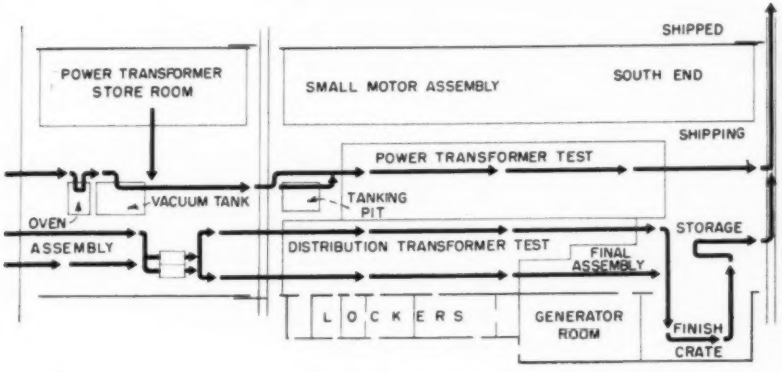
### Templets Aided Layout

Once installed, nearly all the equipment in Building 21—such as winding machines, test stands, tanks, conveyor lines, switchgear, and so on—cannot be moved readily. Going on the obvious premise that it is easier and less time-taking and expensive to cut cardboard than to rip up concrete, planners spent many days going over possible combinations and layout, using scale templets representing every piece of equipment to be put into the building.

Thus, it was known in advance the space each type of winding machine would require, and from operations studies it had been



**Distribution-transformer assembly** lends itself to production-line techniques, so an extensive system of roller conveyors was selected. Section is located in west bay between insulation detail and winding operations at north end and testing and shipping at south end of building. View, looking south, also shows typical construction of building 21




**Material movement** in building 21 takes advantage of existing favorable features in the structure as much as possible. Elevation of north section 6 ft above remainder of building permits delivery of insulation details to storerooms by gravity roller conveyor. Good daylight illumination in side bays was ideal for coil winding operations. High center bay with its heavy cranes was well-suited to assembly, as some units are large and heavy. In some areas, alterations were made

learned what space is necessary around the machines for efficient operation. Therefore, the machines were laid out in parallel rows with adequate clearance between each machine and each row. Maximum use of the area was made without overcrowding. Although the natural daylight in the area is unusually good, the layout of the winding machine area had been made so it could take full advantage of the latest type of fluorescent lighting fixtures.

As a matter of course, the building layout was planned to enable an even, continuous flow of work, with the least possible distance to transport the work between various production stages. Likewise, much study was given to suitable "set-down" or storage areas around each unit, and to provide for ample room for safety in "hot" areas. In general, the flow is from the north to the south end of the building where tracks enter for loading finished apparatus.

Only after the best location for each piece of equipment was determined was the underground wiring installed. When this wiring and its electrical outlets on the floor were completed, each unit fit in its predetermined location.

### *Conversion Was Scheduled*

In the actual setting-up of the building, time was a most important consideration. It was necessary to remove almost all existing equipment, except major units such as cranes. In re-equipping the building, it was necessary to schedule activities carefully to avoid lost production time. Although most of the equipment was new, units also came from our Emeryville plant, and production in Emeryville had to keep going as long as possible before transferring all transformer manufacturing activities to Sunnyvale. Accordingly, a rigid schedule was set up to hold idle time to a minimum.

Units were ferried by truck from Emeryville, 45 miles away, according to a logistical plan which made it possible for both ends of the line to be in operation right up to the very end of the transfer. Whenever any piece of equipment arrived at Sunnyvale there was a definite place and use for it. Necessary outlets from the underground conduits were ready to be connected, and the space was already cleared. In some cases, equipment was in operation at Sunnyvale less than 48 hr after it was removed from Emeryville.

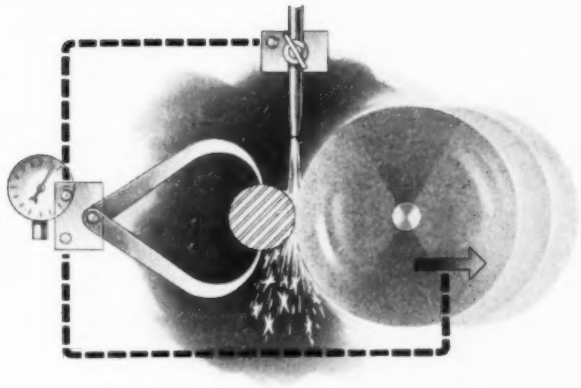
At present, Building 21 is going full blast. Production as of April, 1949, averaged approximately 120 power transformers, ranging from 150 to 5,000 kva rating, and about 2,000 distribution-type transformers, per month. Although a few minor modifications may be made soon to help handle the additional amount of business being received, the plan and its execution have proved to be thoroughly practical and successful.

# PLASTIC PACKAGE SEALS VALVE TAPPETS

BY CHESTER S. RICKER, DETROIT EDITOR

High finishes on tapped assemblies for silent hydraulic valves are protected during shipping and storage by airtight plastic containers. A fresh tappet assembly is picked up in a thin cardboard strip that loops around the tappet and supports it from a conveyor chain. The tappet is then transported through a molten bath of "Sealpeel." When the plastic dries, the whole tappet is covered, and only the end of the cardboard strip is outside the plastic coating. Each tappet is then boxed for service.

At the repair shop, the mechanic follows directions printed on the tab of the strip, "To remove coating, cut film and peel like an orange." The tappet comes out in the same condition in which it left the assembly line. Loss of value from the injurious effects of exposure to air is thus avoided.



# Automatic Sizing
## applied to plain grinders

WM. M. STOCKER, JR.
Assistant Editor

MACHINE AND GAGE manufacturers provide a variety of automatic size control gages for cylindrical grinders. These increase production and lower costs, meanwhile holding closer limits than is usual with manual control. Here are available types including setup procedures, and their application to various grinding machines. That "last tenth" of every precision-grinding operation often spells profit or loss for the job. It no longer need be a serious problem as dependence upon operator skill is reduced. Simplicity permits economy, even for small lots

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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# Autosizing Cuts Grinding Costs

PRACTICE tells us that automatic size control is an advantage only when applied to volume production. For cylindrical grinding this is not the case. Equipment now available is so simple to set up that even small quantities can be precision ground at a considerable saving.

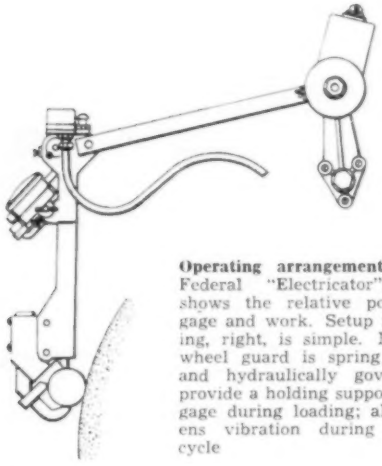
Essentially an improvement on the manually operated, caliper-type, continuous grinding gage, this sizing device provides vigilant grinder control. Plunge-cut grinding is constantly controlled without stopping the work. The dial indicator will detect out-of-roundness, rough finish, and most chatter, but the gaging unit will operate smoothly in spite of these conditions. Units are independent of size controls on the particular machine and sometimes will compensate for slight machine inaccuracies by sizing from the work, rather than from the wheel. Thus the normal necessity for resetting size controls each time wheels are redressed is avoided, but accuracy is maintained constantly. Tolerances of 0.0001 in. or better are readily maintained on most work. Operator fatigue is reduced; the strain of constant checking is eliminated; he need not depend on "feel." A single operator can often handle two or more machines.

A dial gage on the sizing arms provides the assurance of constant visual knowledge of the work in progress. However, in all but one type, this only *shows* what is happening, it is not a control factor. Some form of size control is adaptable to almost any cylindrical grinding machine. Selection of the proper control to suit a particular machine is determined by the type of machine feed—such as sparkout range and feed control. Maintaining automatic sizing within 0.0001 in. depends on proper conditions of work, speed, feed, also correct wheel, accurate equipment and capable setup. A standard setup bar will save considerable time. Once the groundwork is provided, any number of pieces are produced with only occasional checking. Size-control devices are supplied by a number of firms, who sell them built into new grinding machines or as accessories for those already in use. Automatic gages are of two types, single-contact and double-contact units. Both devices have advantages dependent upon their application. Selection of method should be based on grinding equipment and job characteristics. In addition to the gaging methods, there is also an automatic spark-timing method in which sparkout is limited to that required for finish size by a preset timer control.

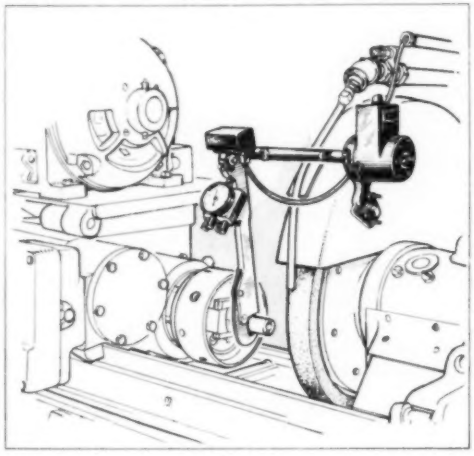
## SINGLE-CONTACT GAGING

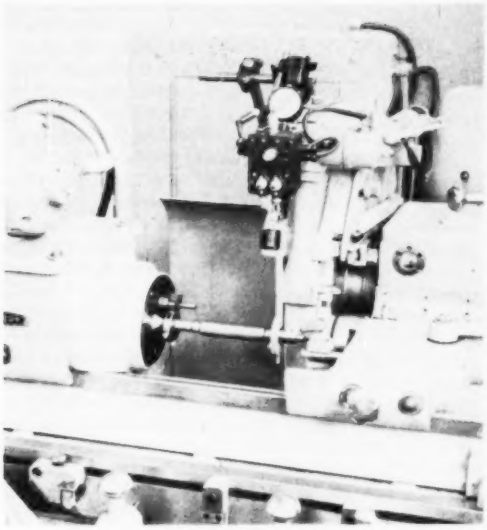
Any method in which a single electrical or other activating contact is made when the work diameter reaches a predetermined size during a grinding cycle is considered single-contact gaging. The contact causes the wheelhead to retract and stops all further grinding. Other than control of sparkout grinding to a predetermined finish size, after the infeed sweep reaches a mechanical stop, there is no automatic control of wheel-feed rate. This mechanical stop, built into the machine, is set in relation to the work size by the feed handwheel. Compensation for the machine variables, which affect the mechanical stop in relation to work size, is made by the operator at the feed handwheel.

Automatic infeed cycles on grinding machines which, for final sparkout sizing, depend upon operator experience can easily be converted to gage control. In this type of cycle, the grinding wheel



**Operating arrangement** for the Federal "Electricator", above, shows the relative position of gage and work. Setup for grinding, right, is simple. Mount on wheel guard is spring actuated and hydraulically governed to provide a holding support for the gage during loading; also dampens vibration during grinding cycle





**"Electrosizer"**, the Foster gage, installed on a Norton 6x18 in. type CTU cylindrical grinder. Power from the gaging head operates hydraulic valves which control wheel feed and operation. Gage is removed from the work, above, by simply pressing the cocking lever and lifting gage clear. Turning a knob to "Manual" permits grinding without gage control for short jobs. Dial indicator is for visual guidance only

head, after starting, rapid-advances to the work. It then changes its rate of movement to a feeding rate, operator-selected with regard to work size, desired stock removal, and horsepower available at the wheel. At a preset point just before the work reaches final size, the infeed movement is stopped by some positive means. As a result of the built-up pressure between wheel and work, additional stock is removed—unless the wheelhead is immediately retracted. Final size is determined either by the operator, drawing from past experience, or by a preset time control. Actuated as the feed reaches the positive stop, the timer automatically retracts the wheelhead after a given length of sparkout time, during which stock is removed at a rapidly decreasing rate. Variables such as machine heat, wheel pressure, wheel wear, and cutting efficiency may cause variation in the final size beyond closely specified limits.

Introduction of the single-contact gage control at this final sizing step will cause the wheelhead to be retracted, not at the end of an experience-fixed time, but when the work reaches a definite size.

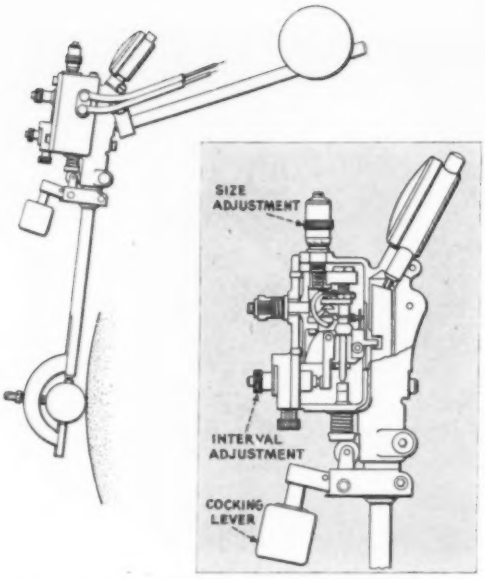
Final size and surface-finish quality depend largely on the sparkout, or finish-grind, curve of the machine. So, successful operation depends on a sparkout curve broad enough to cover the variables normally found which affect the beginning of sparkout in relation to work size. Machines equipped with a single-contact gage should be set so that work comes to size in the last portion of the sparkout, to produce a better finish and allow the gage to operate with accuracy.

"Feeding" which results from the built-up pressure between wheel and work must be sufficiently slow to produce a reduction in diameter per revolution of work well within the roundness requirements. If this period is too short, the size may be correct, but the work out of round. Conversely, if the sparkout period is too long, size and roundness will be correct, but production will shrink. Either of these conditions can be improved upon by an adjustment with the feed handwheel.

Single-contact automatic sizing equipment can be applied to new machines at the factory, and in the field—to machines which have the automatic infeed feature. Machines with broad sparkout curves are more readily controlled and therefore better suited to this type of gaging. There are some machines in use on which feed control and response are not adequate for efficient operation with a double-contact gage. For this type of equipment the single-contact gage is the practical choice as it improves on manual control while saving time and patience. Requirements of feed and control are not so exacting for machines using this unit, but tolerances should be wider than with the double-contact type. More operator care, with greater attention to final sizing and inspection, is required.

## DOUBLE-CONTACT GAGING

Full advantage of *automatic* sizing from the work is only obtainable by the use of the double-contact gage. With this type, wheel feed does not come to a mechanical stop, but is controlled by the gage which automatically operates a suitable valve or relay to stop or slow the feed a preset amount above finish




**Compact design** is a feature of the Foster gage. Requiring no additional power unit, all controls and operating devices are in the head. Power of 110 V. at the head is sufficient to operate valves and relays. The dial indicator has no part in gage operation, serves only to guide the operator.

size. This feed stop, in relation to work size, is not affected by variables of the machine, but is in direct response to the work size. Feed rate as well as the interruption of the cut is controlled in relation to work size, which eliminates the mechanical stop. The gage stops or reduces feed for sparkout in response to the work size. Satisfactory operation of the double-contact gage is dependent upon smooth and steady feed, plus uniform machine response.

On most new machines, where the sparkout range has been reduced, it is necessary to continue feeding during the sparkout to be assured that size will be reached. Final sizing, when approached by sparkout only, is not positive. A finish, equivalent to true sparkout, is obtainable only with a very slow feed rate. This slow rate is limited to a minimum depth of cut, normally 0.001 in. when automatic control is used. The time saved over manual control is considerable.

Double-contact size control is so simple to set up that it can be used to advantage on even very small quantities of pieces. Standard size bars are very helpful in setting up, but the contacts can be adjusted within the desired tolerances without them.

The finish size is set and then the slow-feed contact is adjusted a suitable amount above finish size. The workpiece is placed in position, and the first piece run and checked. Minor size variation can be compensated for by a separate adjustment, and the job is ready to run. All sizing gages operate on the principle of the comparator, which requires that the contact points be set to some established size approximating the finish size desired. Adjustment is then made to actual size with the adjusting screws. Lacking a standard size bar, the contact points may be set to a plug gage, a telescope gage, or a piece of round stock.

All of the double-contact units now on the market function by making or breaking two electrical contacts in relation to work size. The final contact is made when size is reached, and the first contact is made a preset and adjustable amount above the final contact, to control the sparkout. The manner of converting the electrical contact into machine response is the same in all cases. On the other hand, the means of establishing the electrical contact differs in each case. However, each type of sizing gage is interchangeable, except for wiring, with any other type on most cylindrical grinding equipment. All provide very satisfactory performance.

Automatic sizing gages are manufactured by Federal Products Corporation, Foster Engineering Works, and the Landis Tool Company. Cincinnati Milling and Grinding Machines, Inc., and the Norton Company make use of either the Federal or the Foster gaging equipment to automaticize their grinding machines, according to the application and buyer preference. Brown and Sharpe Manufacturing Company uses the Foster gage with a modified cocking arrangement, plus electronic control of coarse and fine feed through a separate control panel. The Landis Tool Company manufactures its own gage for use on Landis equipment only.

Automatic size control in a slightly different vein has been achieved by the Van Norman Company, through development of a dual comparator gage for controlling the grinding of inner ball-bearing race groove diameters from their respective outer races. This makes possible the matching of races at the machine.

## FEDERAL

The Arnold continuous caliper-type grinding gage is the basis for the Federal unit. The standard dial indicator is replaced with a dial indicator having an Electro-Limit tolerance unit built into its back. The caliper speeds adjustment for short runs of pieces. A non-reversing, trigger-type electronic circuit picks up the signal from the electrotolerance back, causing a relay to operate the machine control. Chatter and rough operation are minimized by using the trigger circuit, the tubes being so interlocked that when either contact is made in the gage head, that limit control in the power unit functions, and it is not possible to go in the reverse direction. Power at the gage is kept to six volts and a few milliamps current, which protects the operator and reduces the possibility of arcing.

Setup is easier than with most automatic controls for other purposes. Two electric limits are provided in the gage which determine the operation of two relays. The first limit-adjusting screw establishes the changeover point relative to the indicator dial graduations, where the rate of wheel feed switches

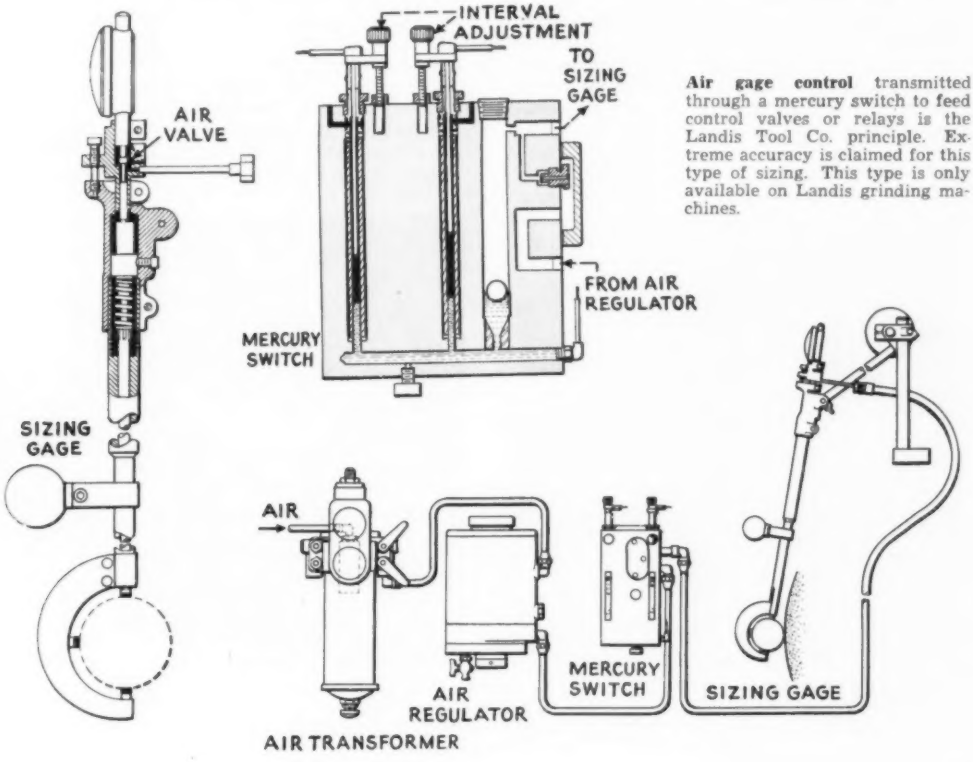
from fast to slow, or sparkout, grind. In normal practice this setting is made so finish feed takes place when the stock is approximately 0.001 in. oversize. Clockwise rotation of the screw decreases the spread from the changeover point to the finish size, while turning counterclockwise increases it. A second limit-adjusting screw determines the point at which the wheel backs off. This is usually factory set and need not be touched. Turning this screw clockwise moves the electrical contact so the cycle is stopped when the indicator pointer is to the left of zero. Once the limits have been set for a given tolerance, change is seldom necessary. A screwdriver adjustment is provided for minor changes resulting from slight inaccuracies or contact-shoe wear, where no tolerance change is involved.

No manual cocking or resetting is required, as the gage is automatically reset with the starting of another machine cycle. However, the machine can be provided with a switch so it can be operated as a conventional grinder by turning the switch from "Auto" to "Manual." As an additional safety precaution, the automatic machine stop not ordinarily required when using the electronic gage should be set 0.002 or 0.003 in. under the desired finish size. Gage design is such that an interruption or break in its power supply will cause the wheel to back off. Oversize pieces are the result of worn caliper contact points, but wear is limited by the use of tungsten carbide points. The slight burnish mark sometimes left on the workpiece by the contact shoe has no measurable effect on the diameter. Dimensions of every tenth piece, or as the quality control chart indicates, should be checked independently of the gage to assure uniform production.

## FOSTER

Single-, double-, and triple-contact gages are manufactured by the Foster Engineering Company. The company also manufacture hydraulic valves which will control the advance of the wheelhead slide to feed as slow as 0.001 in. in 20 sec, without jump or chatter. This control will produce a better finish and sizes comparable to those resulting from complete sparkout. Regulation to a point at which less than 0.000010 in. of stock is removed per revolution of the piece is possible with this slow infeed. At an established point in this fine feed, work diameter reaches exact size, contact is made in the gage head and the wheel is retracted from the piece.

Accuracy of control is obtained in the gage mechanism by allowing a size block to pass between two tungsten-carbide-faced jaws, both of which are rocker arms. One jaw is adjusted by the 0.0001-in. micrometer amplified ten to one and the other is a bellcrank, operated by a plunger in the gage which




**Air gage control** transmitted through a mercury switch to feed control valves or relays is the Landis Tool Co. principle. Extreme accuracy is claimed for this type of sizing. This type is only available on Landis grinding machines.

in turn contacts the work. Light will pass through a space of 0.000011 in. Therefore, a clearance of this amount will allow a size block to pass between the two points, thus making the electrical contact.

Two micrometer adjustments are provided in the gage to correct for parts wear. Of these, one advances by 0.0001 in. or less and the other, amplified ten to one, sets the fine measurement of plus or minus 0.000050 in. All controls for parts wear and change of tolerance are maintained within the gage itself. Adjustments may be made within a few seconds. Skill is not necessary in making these changes and, once made, means is provided for locking the setting.

Foster gages operate with 110-volt power at the head. Company feeling, based on experience, is that the gage contacts are kept cleaner at this voltage. The problem of contact arcing is eliminated by making, rather than breaking, the circuit. As most machines operate on a 110-, 220-, or 440-volt circuit, use of 110 volts at the gage will eliminate the need for additional relays.

Visual size indication is provided by a dial gage which gives the reading as transmitted to it by the sizing bar riding on the work.

## LANDIS

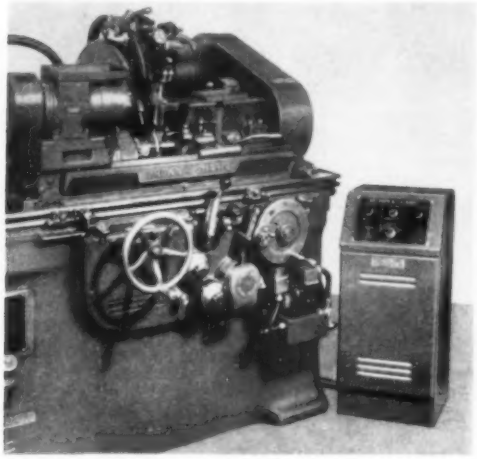
The Landis Tool Company has developed a double-contact gage which makes electrical contact through a column of mercury. This column is actuated by a restriction of air. Flow of air is more restricted as the size is reduced, causing the column of mercury to rise in a glass tube. As the limits are reached, the mercury makes contact with a preset adjustable electrode assembled in the tube. The unit is composed of a sizing gage, mercury switch, air regulator, and air transformer.

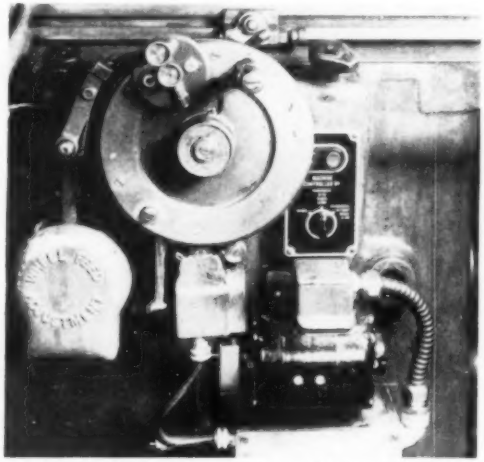
Air under line pressure from the plant system enters the air transformer; from there it passes into the air regulator. This transmits air at constant pressure to the manometer-type mercury switch. An outlet on the switch permits a limited amount of air to go to the gaging head. Two contact shoes on the "caliper" are fixed, the third is movable. This one transmits the change of size through a sizing bar to a small poppet valve in the gaging head. Air from the mercury switch enters the gaging head, but is restricted by the valve, causing pressure to build up in the switch. The mercury rises until it completes the circuit with the first, or changeover, contact, then continues to rise until the finish size is reached and the wheel backs off. At this point the valve is tripped. Placing a new piece in the machine opens the valve and the mercury drops, ready to repeat the cycle. The dial gage is merely for the convenience of the operator; it has no effect on the operation of the unit. Very close limits are held with this gage as a result of the air-control technique.

## NORTON

Norton Company in its "Nortonizer" uses the Federal "Electricator" or the Foster "Electrosizer" to provide automatic gage-governed control of wheel-feed and the wheel-stop positions. The rate and amount of feed produced by the precision-micrometer revolving feedscrew arrangement are controlled by valves actuated by either of these units.

As the wheel grinds the work under preset adjustable infeed control, a metal-to-metal contact exists in the entire wheelhead-feeding mechanism. Reduction of work diameter size within 0.001 to 0.0015 in. of final size causes the caliper to engage a preset contact in the gage head. This, through electrically





**Preset panel control** of feed is featured in the Brown & Sharpe Mfg. Co. autosizing arrangement. Working in conjunction with the Foster "Electrosizer", it is an electronic feed control which determines the speed of a small variable speed motor driving the cross-feed handwheel. It is preset by means of rough and finish feed knobs plus signal lights on the panel. This equipment must be installed at the B. & S. factory.

**Sparkout control,** based on a preset sparkout timer plus a feed limit switch and cam. Switch, actuated by cam on handwheel, determines beginning of sparkout time cycle. Another approach to size control, this is the B. & S. automatic cycle and spark timing arrangement.

controlled hydraulic valves, reduces feedscrew rotation rate to an ultra-fine, or sparkout-equivalent, feed. Adjustment is provided for varying this rate to satisfy conditions peculiar to each type of work. Advancing at this ultrafine feed, the wheel continues to grind until final size is reached, as determined from the work diameter by the caliper and gage. The wheelhead then retracts automatically and resets for the start of the next cycle.

Accuracy of this mechanism is largely a result of the absence of those variable hydraulic contact areas normally found in conventional automatic-feed designs.

### CINCINNATI

Foster or Federal gages are provided according to customer preference to automaticize the various "Filmatic" grinders on which this type of control is applicable.

### BROWN & SHARPE

Modification of the Foster "Electrosizer" cocking arrangement plus electronic control of rough and finish feed are features of the B. & S. "Automatic Cycle and Sizing Arrangement."

After loading, the operator brings the wheel into direct contact with the work, then places the gage on the work, simultaneously starting the automatic cycle by depressing the special trigger arrangement on the gage. The trigger arrangement prevents accidental starting, a safety factor. It also insures against faulty cycle operation resulting from gage disturbances as the gage is being placed on the work.

As on all double-contact gages, the cycle switches from coarse to fine feed at 0.001 to 0.003 in. before reaching final size, as controlled by a predetermined setting of the gage. Reduction in work diameter per revolution of the headstock, from 0.0002 to 0.001 in. in coarse feed and 0.000050 to 0.0001 in. in fine feed, may be selected with the knobs on the front of the electronic control panel. Test lights, adjacent to the selector knobs, simplify the gage setting in conjunction with the master.

Turning the selector switch on the panel to the position marked "No Automatic Sizing" will quickly disengage the arrangement, thus leaving the standard machine for short-run lots.

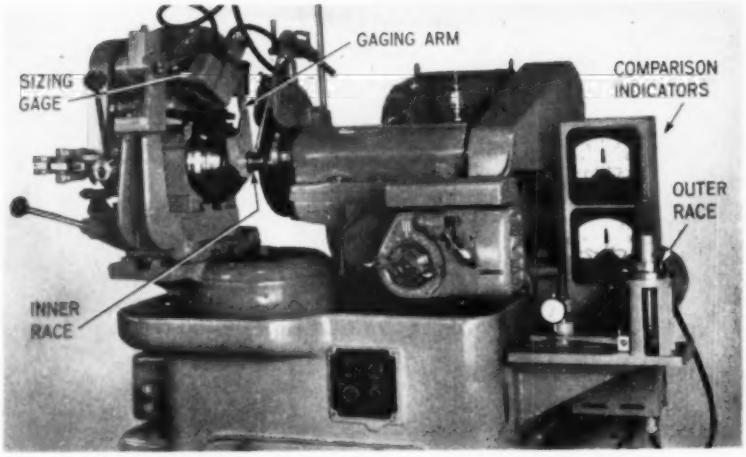
The cross-feed is driven by a variable-speed motor controlled by the work diameter through the gage and electronic control unit. When the work reaches finished size, the wheelslide is withdrawn, the coolant is shut off, and the headstock stops.

This arrangement must be fitted to the machine at the B. & S. factory. It is also necessary to have the No. 5 plain grinding machine fitted with a wheelslide rapid-travel arrangement.

B. & S. also manufacture the Automatic Cycle and Spark-Timing Arrangement mentioned previously. This device is not truly "automatic sizing" in the sense of the gage type of device which is the subject of this report. However, it should be discussed.

Equipment for timer control of sparkout is less complicated and less expensive than the devices for gage control of size. Operation is simpler but accuracy is more dependent upon operator experience and machine controls. It will not compensate for wheel wear and wheel truing, which must be taken care of in the usual way. An advantage of timer control lies in its not being confined to plunge cut grinding. It can be used with reciprocating table, using the normal amount of sparkout time which an operator would allow for traverse grinding were the automatic cycle not available.

As it consists only of a spark-time adjusting knob, a feed-limit switch cam, and a feed-limit switch, setup is simple. The timer is adjusted between 2 and 180 sec from experience, even while the machine is in operation. A signal light serves both to indicate that the machine is operating and as an aid to the operator in properly positioning the feed limit-switch cam. This cam, located on the crossfeed handwheel, is set by loosening the clamping bolt and




**Match grinding** of bearing races is accomplished by setting up two electronic gages so that they are equally balanced only when the sizes of both parts are equal. A fitting operation is eliminated as bearings are matched at the machine

moving the cam to synchronize it with the picking-off of the last tooth on the crossfeed handwheel, Placing the piece to be ground in position, the operator disengages the feed pawl. Making a single, oscillatory movement of the crossfeed handwheel, which includes the approach and initial grind, he then re-engages the feed pawl. After this the cycle is completed automatically, at which time the wheel slide withdraws, the headstock stops, and the coolant is shut off.

Simply clamping the feed limit-switch cam in a position to clear the switch converts the machine to regular operation for small lots where the automatic feature is not desirable.

## VAN NORMAN

Application of electronic gage control for match grinding the inner race of a ball bearing to the outer race has been accomplished by the Van Norman Company. Equipment necessary for this type of control on an oscillating type radius grinder is considerably more complicated than that previously discussed for plain grinding.

Automatic sizing similar to the type of double-contact gaging used for cylindrical grinding, except that the radius grinder utilizes five motors all requiring control, had been used for some time. Based on this unit, a matching comparator gage control was developed using two independent electric gage heads, energized in parallel from a common power source. In this arrangement, one gage measures the groove diameter of an outer raceway and the other gage rides on the inner race and checks its comparative size while it is ground. Tracers are diamonds and the machine is controlled by the out-of-balance current differential between the two gages. Operating through a bridge and electronic relays, this current provides power to magnetic relays which are connected to the control circuit of the dc feed motor.

Production of several hundred inner races matched to a single outer race, with a total variation in groove diameter of approximately 0.0001 in., is possible with this gaging equipment. One operator can readily attend two machines. Cost savings made possible by match grinding are a sizable percentage of the entire bearing cost.

## EXAMPLES

Production benefits derived from automatic, double-contact, sizing are indicated in the following examples, drawn from use in a number of forms and a wide variety of manufacturing operations.

(1) 700 shafts were ground in a regular 8-hour shift. Six pieces were scrapped because they would not clean up. The balance were all within 0.000075 in.

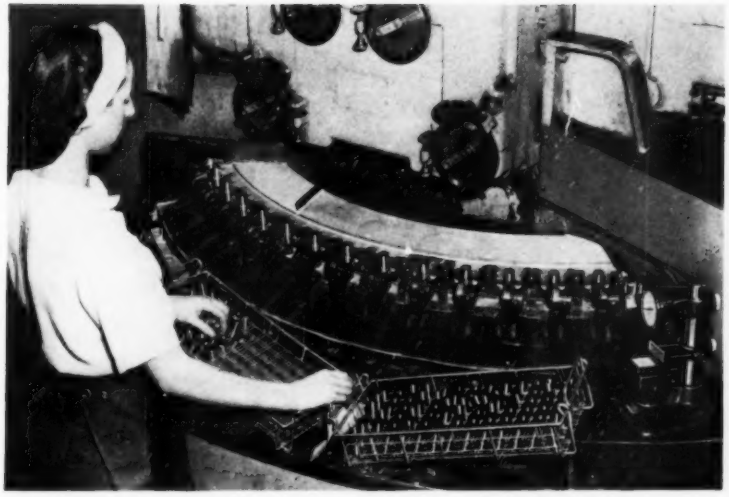
(2) Using carbide contact shoes and the non-reversing circuit, a shaft of which 30% is flat was produced within 0.000080 in.

(3) In one plant, work is successfully and regularly ground with a stock removal of 0.008 in. in a cycle time of 20 to 25 sec, producing an average of 120 pieces hourly.

(4) Production, at another plant, has been continuous over a period of months at 100 pc per hr without a single rejection caused by the grinding operation.

Published in 1944, a German article on automatic sizing suggests the saving possible with equipment of this type. Experience in the years since has provided many additional improvements:

| PART | WITH | WITHOUT | PERCENT INCREASE |
|---|---|---|---|
| Mandrel | 0.75 min. | 1.3 min. | 74 |
| Spindle | 0.2 | 0.9 | 123 |
| Valve Shaft | 0.7 | 1.2 | |
| Bolt | 0.6 | 1.8 | 200 |



**Tappet bodies** are finished to exact length in one pass through four-wheel Hanchett surface grinder. Clamp and release of parts is automatic. Cadmium-plated baskets hold bodies so they can't mar each other

# 50-MILLIONTHS CLEARANCE BY UNSKILLED WORKERS

**High production—and accurate production—**

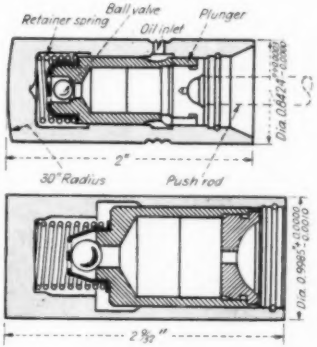
**is turned out at Diesel Equipment Div., G. M. C., by unskilled women workers**

**who follow techniques developed on Diesel-engine injector production lines**

BY CHESTER S. RICKER
DETROIT EDITOR

THREE different hydraulic-valve tappet models; for Buick, Cadillac, and Oldsmobile; have different dimensions, are made from different materials, and are heat-treated differently. Yet all three are produced at a total production rate of 50,000 units a day by women workers at Diesel Equipment's Grand Rapids plant.

Production was attained by utilizing the latest machines, connected by automatic conveyors or hopper feeds. Loading-time proportions for each operation were reduced by making multiple operations possible at one setting of each part. For example, gages survey more than one dimension at one location of a part—making




**Two different tappets** have oil inlet on side (above—for new Cadillac engines and through pushrod (below—for Buick). Lengths and diameters vary, as do end profiles. Minor internal differences can be seen—include different plunger size

100% inspection possible, and practical, too. All completed units are given operational tests, and if they fail, they are disassembled and the elements are reinspected so perfect parts can replace duds and the unit can be finally passed.

Cadillac's tappets are cut from SAE 5120 bar stock on Acme-Gridley automatic screw machines, gas carburized in Holcroft production-line furnaces, then finished on automatic-feed Landis and Cincinnatic centerless grinders. Average finish is about 4 microinches (rms). Cadillac plungers are faced and bored on multiple-spindle New Britain boring machines that are magazine fed. Body bores are held to 0.0005 in. on Micromatic hones.

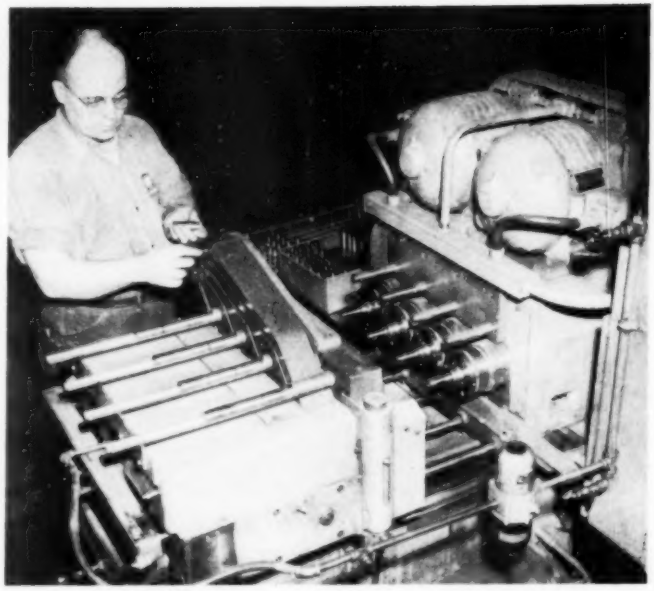
Buick's tappets are gray-iron castings, bored on four-spindle Ex-Cell-O hopper-fed machines with

automatic cycling. The chilled feet that bear against the cams are ground by four wheels in a Hanchett grinder in a continuous operation. These ends are square on the Buick model, but the Cadillac ends have a 30-in. radius, while the Oldsmobile ends have a 60-in. radius. The curved ends are generated and lapped on nine-spindle Gisholt honing machines.

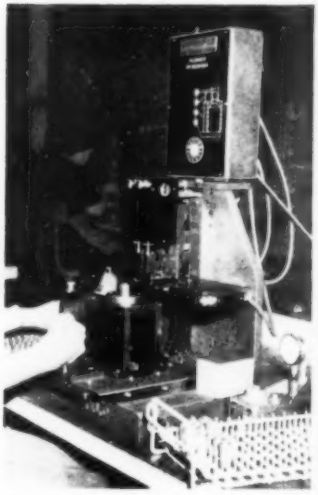
Oldsmobile and Cadillac tappets are Lubrited—Cadillacs are finish-ground and vapor-blasted with a fine grit in preparation—while Buick tappets are Ferrox-treated.

Total allowance on the body bore for all three models is 0.0005 in. diametrically. This dimension is split into ten divisions so bodies and plungers can be assembled selectively, so Sheffield air-gaging amounts to 50-millionths accuracy. Gage classification allows matching bodies and plungers.

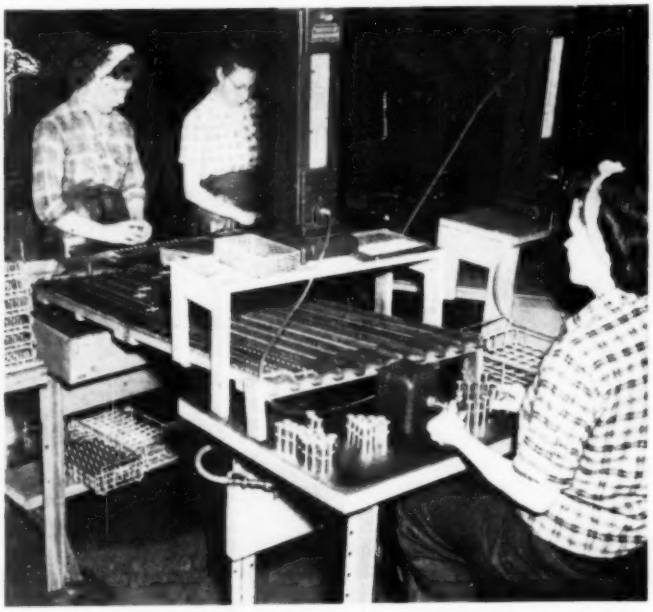
Parts-handling in process is with cadmium-plated wire baskets because the steel wire can be kept clean. After assembly, the units are shipped in corrugated, compartmented boxes that are easy to handle and keep the tappets separated. Service units are sealed in plastic and are packed individually.



**Multiple-operation machining** of tappet parts is typified by four-spindle Ex-Cell-O boring machine with magazine feed. Work feeds in four slots in top and comes out (tappet barrels bored) troughs at hopper bottom

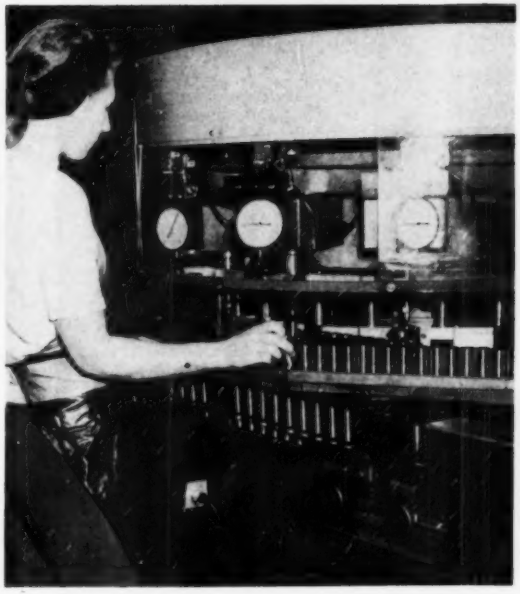


**Inspection** at Sheffield gage checks tip dia, bore dia, body length, and distance from body face to ball-valve crown. Light indicator shows up tolerance violations and classifies cause of rejection



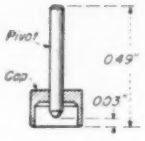
**Selective assembly** starts with air-gage classification of parts in ten divisions, marked A to K. Operator checks bodies and plungers and sorts them into inclined channels. At other end operator matches A's, etc.

**Clean assembly** is insured by conveyor-line cups that carry bodies. Cups are filled with non-corrosive filtering mixture of kerosene and light oil (Saybolt 33 at 100F) which keeps out dust and dirt



**Assembled inspection** on rotary test machine times tappets. Leaks over 1/16 in. in 6 to 20 sec, or ⅛ in. in 12 to 40 sec under 50-lb load reject units. Test production is about 1000 per hour

**Meter pivots** are carried to and from cleaning table in covered trays that are drilled to hold pivots upright. Cornstalk is chopped off with penknife after each pivot is cleaned to expose new surface. Operator rotates a pivot about three times against the pith to wipe off impurities




# CORNSTALK CLEANS METER PIVOTS

BY WILLIAM R. APBLETT, Tool Engineer
SANGAMO ELECTRIC CO.

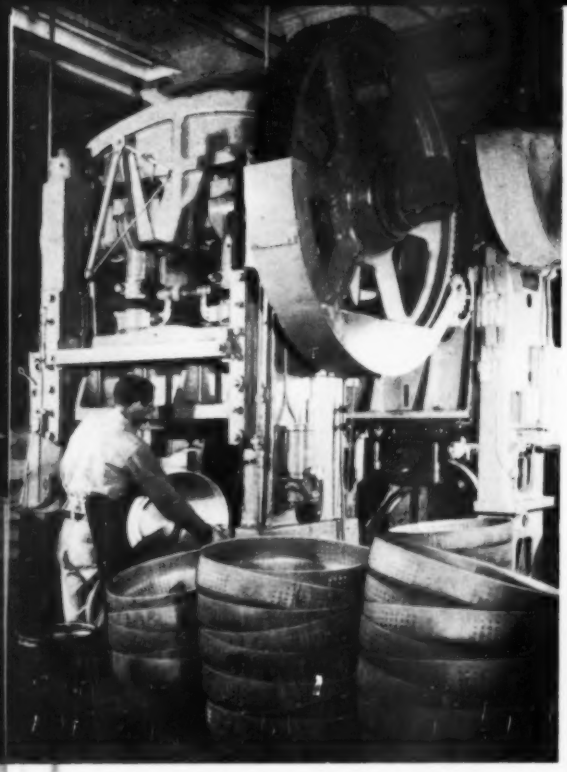
ANY kind of dust, dirt, oil, or moisture can throw off the accuracy of an electric meter if it settles on the small pivot. When these pivots are exposed, cleaning before they are assembled into the meters is easy; but some pivot points are protected by caps and are almost impossible to reach. For these few cases, the best cleaning method has been found to be pressing and rotating the pivots against the end of a rod of cornstalk.

After manual cleaning the pivots are checked through a binocular microscope by an experienced inspector.

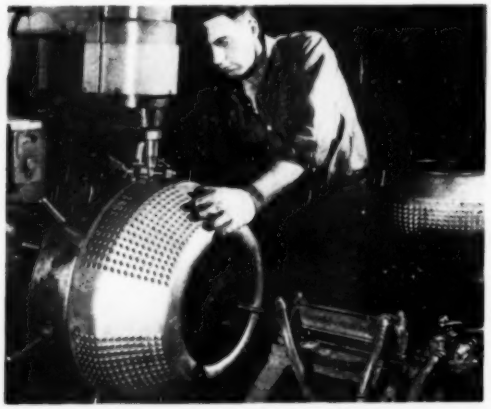
# AUTOMATICS WELD

**Hand-welding techniques have been replaced by automatic submerged-arc and coated-electrode welders, in conjunction with rapid-fire resistance spotwelders, at Westinghouse's Mansfield Works to attain uniform accuracy, cut operator fatigue, and smooth out production flow**

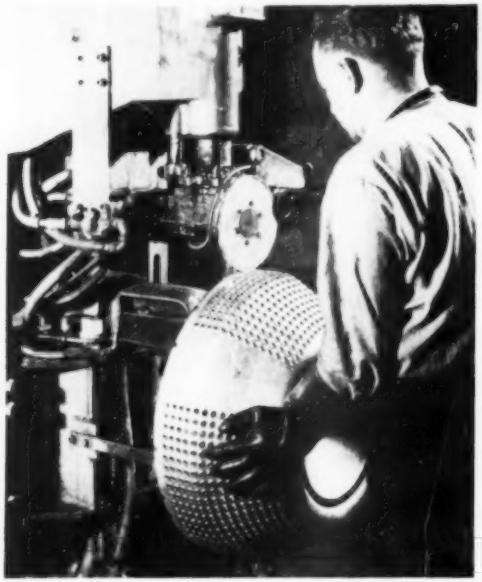
BY FRED GANDERT, Welding Engineer,
WESTINGHOUSE ELECTRIC CORP.



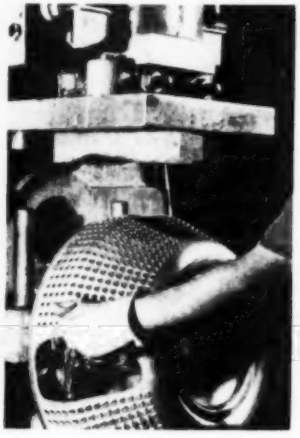
**1** **Drawn tub shell** is punched four times in one of two Bliss presses to pierce and extrude 896 drain holes, 224 at a stroke. Tub stock is 0.050-in. enameled steel



**2** **Top flange section** is aligned with tub shell in fixture on Sciaky spotwelder, clamped by air cylinder on carriage in front, and tacked to shell in 20 places around the 23½-in. diameter



**3** **Tub sections** are meshed together to single-sheet thickness and seam welded on Taylor-Winfield machine at speed of 48 ipm. Lap joint is formed smooth on the inside



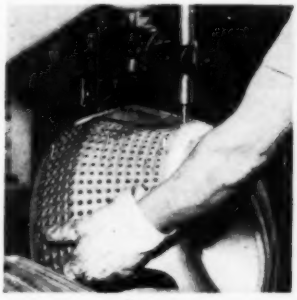
**4** **Four louver openings** in each tub are blanked out one at a time on Cleveland 8-H horn press. Part delivery and removal all along fabrication line is by roller conveyor

# SPINNER-TUB ASSEMBLIES

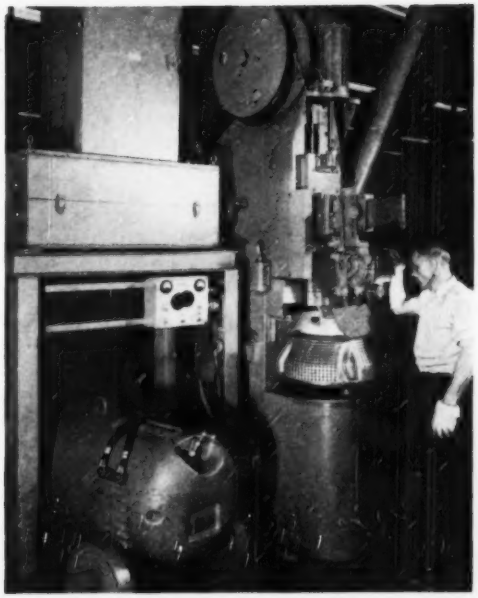
PRODUCTION-WELDING operations on Laundromat spinner tubs are divided into two groups—before and after the vitreous enamel is applied to the tub surfaces. Those surfaces that are to be welded after the enameling job are carefully wiped clean of frit so the baked finish will not be damaged when enamel is removed.

Production flow is controlled by locating each group separately in the plant. Inside each group, floor-plan layouts provided conveyors for continuous flow of parts to and from machine setups, which also reduces pile-ups between machines.

Back tubs for the washing machines are processed separately. All automatic welders used to process both kinds of tubs were specially designed in Westinghouse's Buffalo Division.

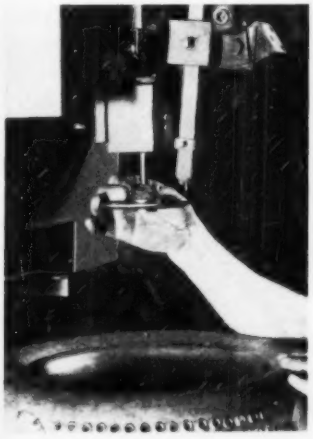


**5 Washing louvers** are spotwelded into openings by 75-kva Taylor-Winfield air-operated machine. All 22 spots, ¼ in. in diameter, are equally spaced around joint



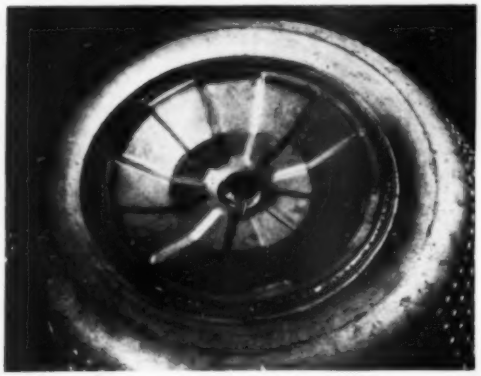
**6 Hub-washer assembly** is joined to bottom of spinner tub on Westinghouse automatic arc welder. Lightly fluxed wire feeds from coil above machine to welder head, which is moved into position by air cylinder. Power is supplied by portable welder and control panel

**7 Table-high roller conveyor** serves tub-fabrication group. Two machines in foreground are automatic arc welders developed for joining hub-washer assemblies to tub bottoms



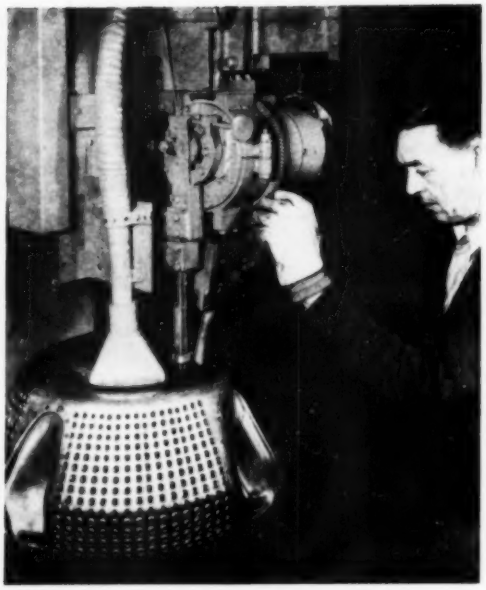
**8 Hub-washer assembly** is screwed onto locating stem and fitted in spring-loaded fixture over inverted tub. Welding head is lowered and spring fixture locates hub

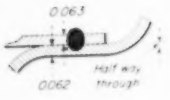
**9** **Finished** tub-hub joint is clean, smooth, and sealed



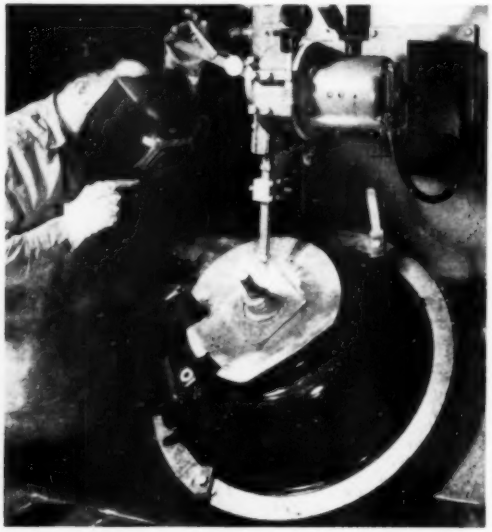
**10** **Diaphram** is welded to tub, must have a good joint

**12** **Hardened steel shaft** is welded into spinner after tub has been enameled. Shaft is threaded into hub washer, swinging arm locates tub over shaft to control spatter, then shaft is joined to diaphragm flange by coated-wire welding. Rotating table makes operation semiautomatic

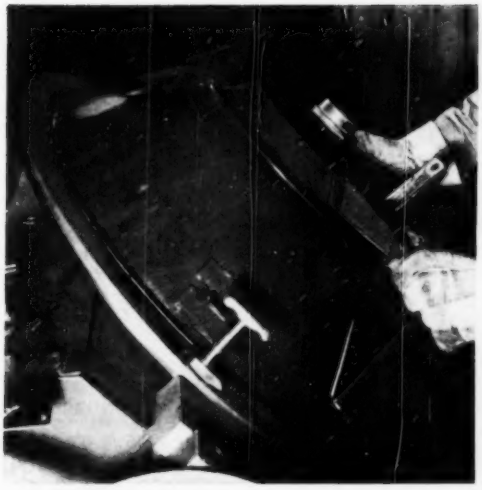




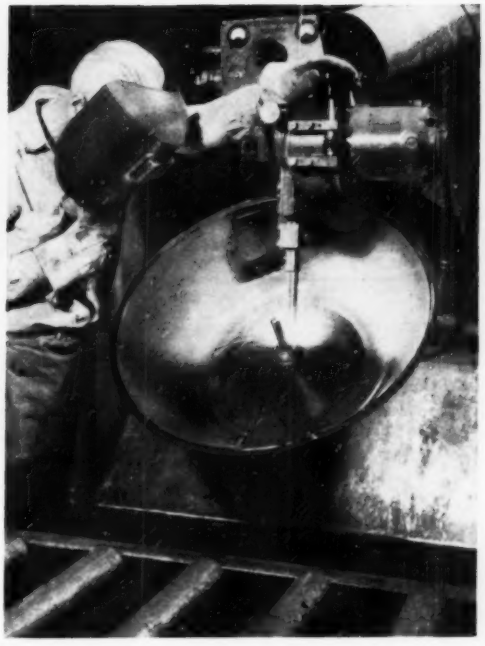

**11** **Rotating table** feeds inverted tub under submerged-arc machine that welds 0.062-in. steel diaphragm to spinner bottom. Operation is unique because weld is through diaphragm, but only half through tub body. Welding speed is 96 ipm with 30v and 410-amp power



**13** **Steel bushing** is welded into back washer tub on Westinghouse machine that has swinging wire-feed head. Tub is enameled except for flange that takes bushing before this operation



**14** **Back tub** is held for welding job by simple clamps on tilting table. The ⅜-in.-dia bushing is welded to the tub on the outside at this setup



**15** **Automatic** arc-welding machine finishes off bushing joint while operator checks visually for flaws. Completed back tub is passed to assembly on roller conveyor

# CITY-WIDE OPEN HOUSE SHOWS EDUCATORS INDUSTRY WHYS

NEW BRITAIN'S 550 public educators recently closed school to visit local industry; B-I-E Day resulted. The first Business-Industry-Education presentation in New England, it is significant to a city largely industrial.

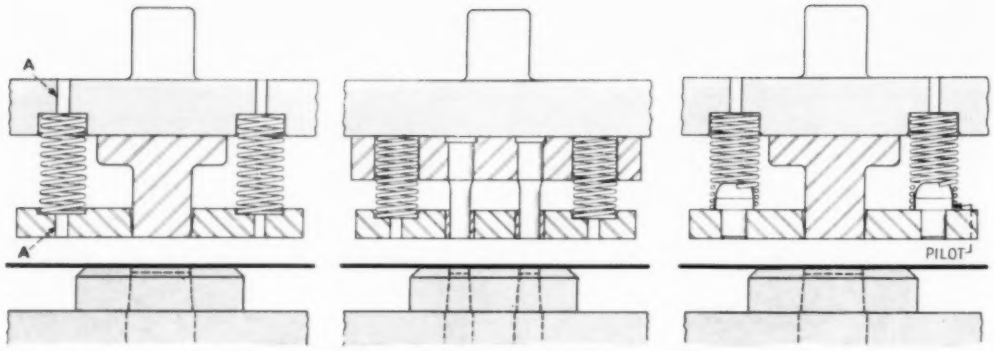
Realizing the importance of public educators in the formation of sound thinking among potential employees and civic groups, eight large plants opened their doors to teachers, head clerks, head janitors, and members of the Education Board. Guests spent the day divided among the participating plants, thus permitting more individual attention and a broad perspective to the group.

Plant tours in the morning were augmented by placards spaced about the plants graphically describing industrial costs, and industrial value to a community. Fafnir, for instance, pays $1000 in taxes every 49 min of an 8-hr day. Employees get 45 cents of every dollar received; raw materials 16 cents; taxes 21 cents; overhead 10 cents; stockholders 4 cents and 4 cents is held to grow on. Employees have pledged $14,644 for Community service.

Luncheon was served in each plant with guests and company officials interspaced about the tables to permit "round table" discussion and conversation. Industry's importance and place in the community was the subject of a series of talks in the afternoon.

A personal letter and booklet about the city industrially was sent to each guest by the president of the host plant a few days following the event. Response from the teachers was most enthusiastic for the program and its value.

**On tour** through the Fafnir Bearing Company plant, a group of New Britain's educators pause to watch a milling operation. Their travels took them through every phase of operation and included an exhibit of the many product end-uses




**Die-Spring Applications When Stripper Bolts Are Not Used**

**Fig. 1**... Counterbored holes in the two plates serve as spring pockets

**Fig. 2**... Through holes are machined in the punch plate of a piercing die

**Fig. 3**... Standardized pilots reduce cost in machining the stripper plate

# ELEVEN WAYS TO USE DIE SPRINGS

**By study of these basic methods, the die designer will avoid trouble in the common applications, and be able to foresee correct solutions for unusual problems**

BY J. R. PAQUIN, Tool Engineer
HARTFORD MACHINE SCREW CO.

CHOICE of the correct method of applying springs to stripper plates depends on: (1) the required pressure, (2) space limitations, (3) shape of the die and nature of the work, and (4) production requirements.

Fig. 1 illustrates one method of applying die springs to a stripper plate. The plate has a counterbored hole, usually ¼ in. deep. The punch holder of the die set is counterbored to a greater depth in order to apply the correct initial deflection to the spring (see "Selection of Stripper Springs."—*AM*—Dec. 18, 1947, p 153). Edges of the holes are chamfered 1/16 in. by 45° to guide the individual coils during compression of the spring.

In machining the counterbored holes, the stripper plate is clamped to the punch holder and holes *A* are drilled through. These are used for pilots when counterboring. Plate travel is limited by shoulder bolts, not shown.

In the piercing die, Fig. 2, the

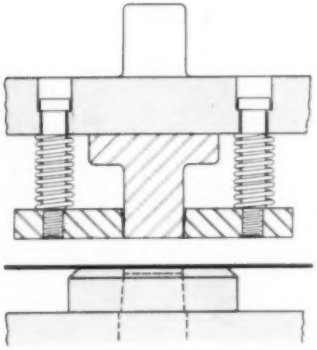


**Fig. 4**... Placement of die springs around stripper bolts, although widely used, is not recommended for high-grade dies

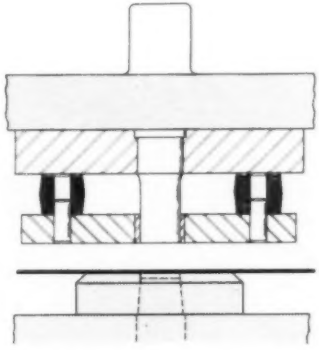


**Fig. 5**... Rubber springs are low in cost, but are attacked by oils used in press work and hence are seldom used on dies for long runs

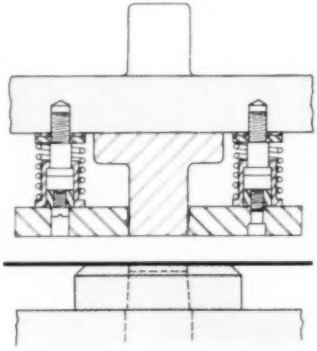


**Fig. 6**..."Strippit" die spring units can be applied in two ways: *left*—the capscrew merely prevents sidewise movement of the unit; *right*—the capscrew holds the locating plug

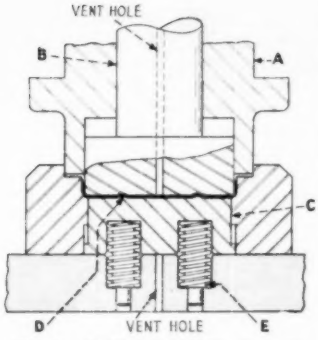



**Fig. 7...** Stripper springs are entirely confined when the pressure pad bottoms, and hence the openings must have a large chamfer and safety pins *E* prevent broken coils from getting between pressure pad and die holder

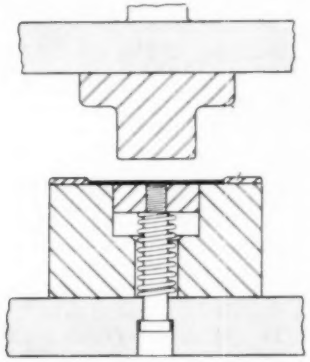


**Fig. 8...** Die springs, surrounding shoulder bolts, support the pressure pad. Since the pad bottoms, the spring-confining hole must be adequately chamfered to avoid pinching the coils

upper portions of the springs are retained in holes bored through the punch plate. The spring ends bear against the ground under side of the punch holder, while the lower ends of the springs are contained in counterbored holes in the punch plate, as in the previous case. Where space between the stripper and the punch plate is not too great, the ends of the springs may rest directly on the stripper plate, avoiding counterboring. However, in this case, it may be desirable to increase the chamfer in the punch plate to as much as ⅛ in.

Pilots provide an excellent means of locating springs, as shown in Fig. 3. In large die shops where pilots have been standardized, and are kept in stock in various sizes, this may be the least expensive method.

In the application shown in Fig. 4 the springs have been placed around the stripper bolts. This method is widely used, although many companies do not approve of the practice, and it is not recommended for high-grade dies.

Standard rubber springs provide stripping pressure, are low in cost, and are readily applied to any die. An application is shown in Fig. 5. However, the compounds used in press work have an adverse effect on rubber. For that reason, rubber springs can seldom be employed in dies intended for long runs.

Standard "Strippit" spring units, shown in Fig. 6, allow removal of the stripper plate without disturbing the springs. The left side of the drawing shows an application in which the head of a socket-head capscrew enters a drilled hole in the stripper plate and prevents side movement of the lower portion of the unit. The right-hand view illustrates a more widely used method of fastening. A hole is drilled and counterbored through the stripper plate for a socket-head capscrew, which is used to hold the locating plug of the unit to the stripper plate.

The blank-and-draw die illustrated in Fig. 7 shows the principles in applying springs where the pressure pad bottoms in such a way that the springs are entirely confined. In use, the die is mounted in a double-action press. Upon descent, the outer ram *A* blanks out the part and applies pressure around the outer edge. The inner ram *B* then descends and draws the metal to the cup shape illustrated. At the bottom of the stroke, the pressure pad *C* bottoms on the dieholder of the dieset, and the circular indentation *D* is produced in the part.

### *Pins Hold Broken Coils*

In this case, the counterbored holes are chamfered at least ⅛ in. by 45°. Safety pins *E* are pressed into the dieholder. If a spring should break, these pins hold the fractured coil and prevent it from getting between the pressure pad and the face of the dieholder. In this manner, they prevent many serious die fractures.

A similar application of a die spring is shown in Fig. 8. This tool is a bending die used to form a flat part to channel shape. Shoulder bolts limit stripper-plate travel, and the springs are placed around them. In use, the part is placed in the gages, and descent of the punch forms it to the required shape. The punch goes down far enough to bottom the pressure pad. This spanks the work and helps to set the bends. Here again, the hole that confines the spring is given a ⅛ in. chamfer

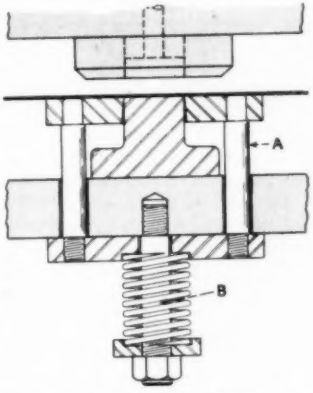



**Fig. 9...** In an inverted die, operation of the stripper plate is achieved with a compression spring and pins *A*

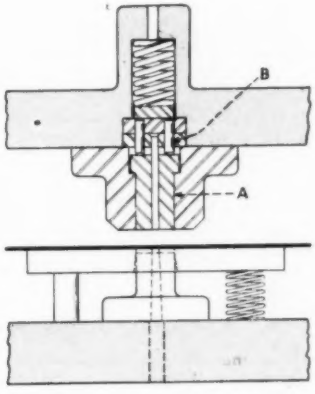



**Fig. 10...** A spring-actuated knockout strips the part and also serves to guide the slender piercing punch

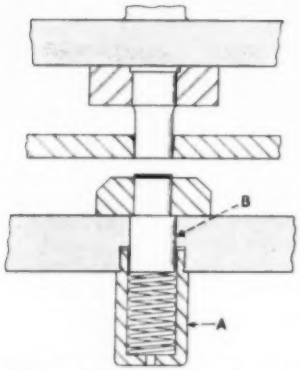



**Fig. 11 ...** When there is no room within a die holder for die springs, a housing is screwed into a tapped hole, and the confined spring actuates the knockout

at least. Stripper bolts will hold the coil if spring breakage occurs.

The stripper plate in Fig. 9 is actuated by four pins *A* through one large spring. Stud *B* is threaded into the dieholder of the dieset, and the lower nut provides a ready means of adjusting the stripping pressure. A check nut, not shown, locks the adjusting nut.

Fig. 10 shows the construction of an inverted compound die which makes use of a spring-actuated knockout in the upper die. The spring is confined in a counterbored hole in the punch shank and applies pressure to knockout *A* through pins *B*.

The shaving die, Fig. 11, shows a method of holding springs below the dieholder, if no room exists within the dieset for them. Housing *A* is threaded into the dieholder. In this application, the part is placed in the gages, not shown, and descent of the punch pushes it into the die against pressure of the spring. The die takes a shaving chip from the outside of the part. On the upstroke of the punch, the spring ejects the part from the die by applying pressure to knockout *B*.

These examples by no means exhaust the methods of applying springs to dies. However, they are the most commonly used, and a thorough knowledge of the principles involved in their construction should form a sound basis for the solution of more unusual application problems.

# Check List for Die Designers

BY E. RAUSCH, Chief Engineer
General Automotive Specialties Company

IN die design, it is easy to overlook some essential point. This list was developed as a final check list to avoid any oversights.

1. Will the die produce the piece or will it make its mirror image?[a]

2. Where is the sharp edge on the finished product? Will it cause difficulties there as small burrs develop?

3. Have the bends actually been tried on stock of the same hardness, same thickness, in the same relation to the grain?

4. Can the finished piece be blown off by compressed air?

5. Will the finished pieces clear the pillar-posts when they are blown or when they drop to the rear?

6. Is there a pilot in the second stage for greater accuracy when starting a new strip?

7. Do succeeding stages allow adequate clearance for extrusions or bends previously formed?

8. Is the stock stop positive or does the die depend upon thin pilots for alignment?

9. Which sections would be considerably improved through hard-chrome plating?

10. Are there any large die parts which could be built as economically or even more so if they are broken into sections?[b]

11. Are those sections easily replaceable where a great deal of wear occurs on vertical walls used for forming?

12. Are the knockout holes in the center of the shank?[b]

13. Is the die shoe large enough for a new stage at either end or at least for a "hitch-feed"?[b, d]

14. Are the punches so designed that they will not smash the heads of the bolts holding the stripper plate?[b]

15. Are the stripper plate spacers high enough?

16. Are any punches so constructed that they will leave very weak sections in the stripper plate?

17. Is the "shut-height" of the die so that it will fit most presses in the shop?[f]

18. Will most presses in the shop take the new die without requiring enlargement of the hole in the bolster plate?

19. Will it be difficult to grind the die when it shows wear?

20. Will the top of the pillar posts be below the top of the punch holder when the die is fully closed?

21. Will the knockout arrangement fit most presses in the shop?

22. Do all screw or dowel holes clear the shank of punch holder?

23. Is there sufficient room for springs which are long enough to withstand high-speed work?[c]

24. Are all pilot holes drilled through?

25. Can all dowel holes be drilled through or is there at least room for a smaller through-hole as a knockout hole?

26. Will those scrap pieces which are not punched through the die drop to the side or rear in sufficient time?

27. Are there adequate provisions for separation of scrap from product?[e]

(a) A vellum strip can be run through the die design and the operations performed on it with a scissor. This is the best check possible.

(b) A full-size drawing of the die on transparent paper in colored pencil and one drawing of the punches in another color will show this clearly.

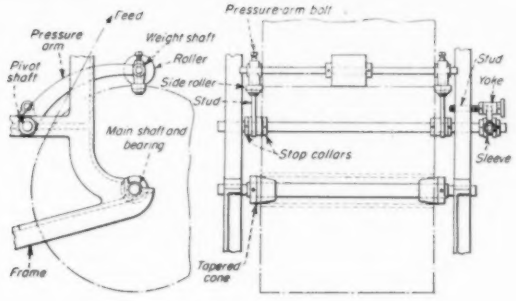
(c) Springs should be used according to manufacturer's specifications; if those are not available, an empirical rule can be used. Springs should not be depressed more than two-thirds of total deflection.

(d) Space for an extra stage will help in the event of small product changes.

(e) Holes should be provided for scrap separator chutes; standard chutes should be available.

(f) It is often a good idea to use a screw and locknut to prevent the die setters from closing the die beyond the optimum position.

# Practical Ideas




## Strip-Stock Roll Mount Adjusts For Pressure and Register

WHENEVER accurate register of strip materials is required, it is advisible to mount the stock rolls in something more substantial and positive than a wooden cradle, as is often done. The mount should be adjustable.

The mount illustrated was originally planned for rolls of paper, but should be equally suitable for thin-gage strip metal. The frame is heavy enough that it will not bend or sway under heavy loads. Stock is located on two tapered cones that are carried in a main shaft. The shaft rests on two half bearings at the end of the mount, in front of the machine the roll is feeding. Both cones are locked to the main shaft by setscrews, which allow adjusting them to any width of stock.

A pivot shaft is located back on the frame, slightly higher than the main shaft. Two pressure arms are located on the shaft by two sets of stop collars that can be loosened and adjusted to spread or close up the pressure arms. A weight shaft supported by the pressure arms carries a heavy roller that acts as a weight on the stock. Setscrews clamp the roller to the shaft, and two bolts on the pressure arms can be screwed down on the shaft to adjust the freeness of the roller which will, in turn, control pressure on the stock. Studs under the end of each pressure arm carry side rollers that guide the roll of the stock; and these can be adjusted for wider or narrower rolls.

One end of the pivot shaft extends out to the side and carries another set of stop collars that confine a grooved sleeve. A yoke mounted on an adjustment nut in the mount frame mates with this groove. When the roll of stock must be adjusted sideways to register correctly in the machine, this adjustment nut can be turned. The action moves the yoke, and therefore the grooved sleeve and main shaft, to one side or the other. *F. H. Hartley, Pawtucket, R. I.*

### Tap Flutes for Thread Chasers

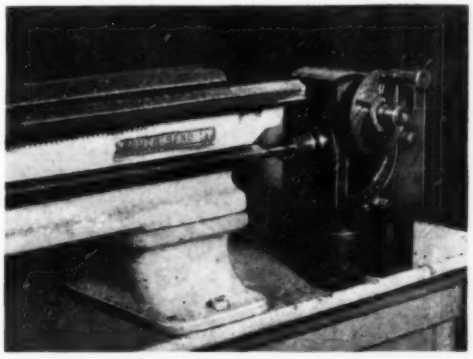
WHEN WE needed an 18-tpi thread chaser for threading locknuts I took a $\frac{5}{8}$-in., 18-tpi tap and cut off the ground flutes from the main body of the tap. Then I brazed these flutes to suitable steel shanks which could be held in a toolholder and used them as thread chasers. Both internal and external chasers can be made in the same way. *Walter G. Albert, Philadelphia, Pa.*

## Extra Traversing Accuracy Provided by Dividing Head

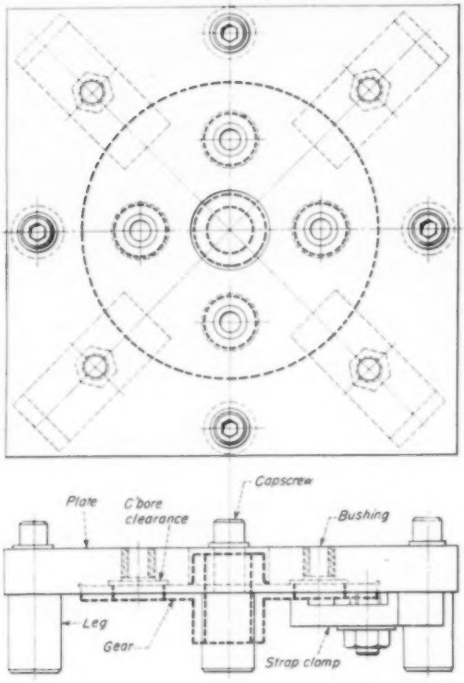
WE WERE confronted with the problem of cutting 160 grooves per inch on a drum that was 4 in. long with a 1½-in. diameter. The grooves had to be 0.00325 in. deep and were to be cut at a 90° included angle.

We set up a lathe to do the job by removing the right-hand leadscrew bearing and mounting a Hardinge dividing head in its place to support the leadscrew in a collet. The dividing head was bolted down to the cabinet on which the lathe was mounted. With this arrangement it was possible to accurately index and measure the movement of the carriage over its entire length of travel by controlling the rotation of the leadscrew with the index head.

This same method can be used for a number of different jobs where the carriages must be indexed along the ways. An important advantage of the



method is that the length of indexed travel is only limited by the length of the leadscrew. *Thomas C. Ash, Rancocas Woods, N.J.*




## Enlarging with Counterbore Eases Large-Hole Drilling

LIGHT JIGS and drillpresses can be made to do heavy drilling jobs if the jig design is such that counterboring tools can be employed for enlarging smaller holes to the required full size. This jig was made for holding a gear that was to be drilled in four places to lighten the web and through the hub.

The trick is in obtaining a counterbore of the right OD that has a pilot that can be matched with a drill. The jig in this case was a simple plate, bored out to hold the gear casting, and drilled for four legs held by four capscrews. Four strap clamps were added to the bottom, or bored-out side of the plate, to clamp the gear. After the gear is clamped, the plate is located with the gear down, and the holes are drilled with the aid of drill bushings in the plate.

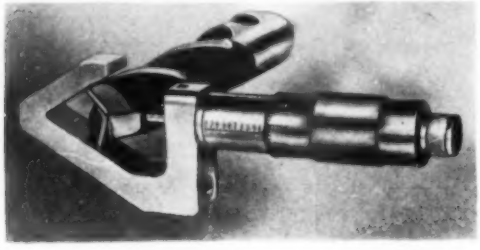
Once the holes are all drilled, the jig is turned over and the counterbores are employed. Clearance under the gear and next to each bushing is allowed to permit the counterbores to clear burrs away as much as possible. Because bushings are the right fit for the drills, so they also match the counterbore pilots.

Relatively thin work can be drilled with this method, even though the holes are quite large. If the method had not been used, this job would have required a larger drillpress and a much larger jig. *Frank J. Peragine, S. Hempstead, N.Y.*

### Rugged Micrometer Measures Three-Flute Cutting Tools

ONE REASON for the lack of popularity of three-fluted reamer drills, bridge reamers, and mills has been the difficulty of measuring their diameters quickly and accurately. Structural companies have continually had troubles in grinding these tools, and even with slow checking methods, accuracy has not always resulted.

In the construction of a new bridge, three-fluted tools were called for; so an accurate measuring device had to be developed. The result is a direct-reading micrometer that utilizes a V-block anvil. The spindle thread was chosen to allow readings from 0.250 to 1.312 in., graduated in standard 0.025-in. spaces. The barrel, however, has two groups of markings of 25 divisions each, so one revolution moves the spindle 50 thousandths.



Construction is unusually rugged, and adjustments are possible to allow for wear. The 60° V-block is made of high-carbon steel, hardened and ground. The inserted tip of the spindle is high-speed steel, which will give good service even on sharp-pointed tool edges. *Leslie Morrissette, Dominion Bridge Co., Lachine, Que.*

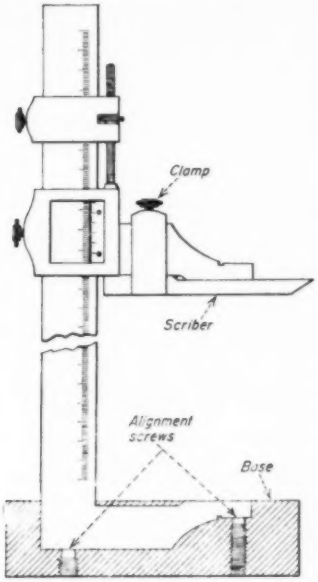
### Extra Tooth Reduces Gear Fatigue

WHEN *exact* gear ratios are not essential, an extra tooth in one gear will serve to distribute wear and shock evenly to all teeth and will lengthen gear life.

For example: if a 4 to 1 ratio is required—but does not have to be exactly 4 to 1—gears with 40 teeth and 10 teeth can be replaced by gears with 41 teeth and 10 teeth. Thus, with every revolution, a different tooth contacts a given tooth on the other gear.

This idea is especially good on gearing for heavy loads where there is a heavy impulse at one position of the pinion. The load will hit the gear in a different spot at each turn, so the load will not break off a tooth so rapidly. *Ray Cafiero, Brooklyn, N. Y.*

***HEAT-TREAT SCALE** on large rough surfaces can be warped off by heating with an intense welding-torch flame. The sudden expansion "explodes" the scale, so goggles must be worn. Robert W. Roedder, Berwyn, Pa.*




## Accurate Height Gage Made From Old Vernier Caliper

ONE TOOL has two uses if a base and scribing indicator are added to a vernier caliper.

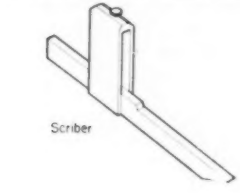
Tool steel is machined to size, drilled and tapped and slotted to the shape of the caliper's fixed anvil, and is hardened and ground. Setscrew holes are provided vertically up from the bottom so the caliper can be adjusted, and screws from the side are provided so the caliper can be clamped tight.

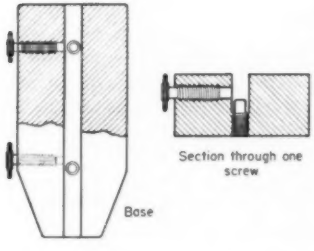
The scriber is likewise machined, hardened, and ground to shape.

A simple yoke with a setscrew holds it to the movable anvil on the caliper, and the arm itself is offset near the yoke to match the face of the anvil. It must fit square and flush with the faces of the anvil.

All setscrews are equipped with brass plugs in their holes so the fine finish on the caliper will not be damaged.

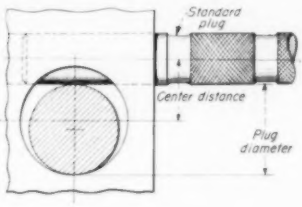
The gage is calibrated by checking the exact distance from the bottom of the base to the top of the fixed anvil. This reading must be added to normal readings to find the true height reading. *Lowell F. Stull, Youngstown, O.*




## Two Plugs Check Centers On Intersecting Holes

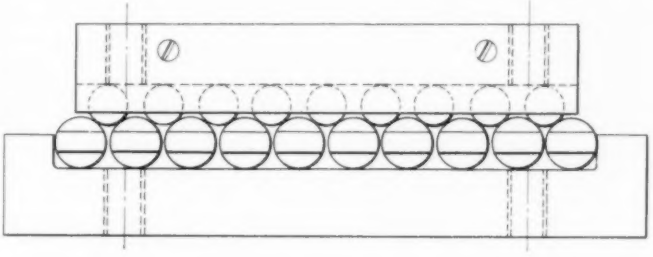
HOLES that break into each other can be inspected for the correct center distance by a two-plug method. A standard plug is taken for one hole—fit should be close.




The plug for the second hole must be made smaller than the hole's diameter, and will contact the hole only on one side. Its size can be found this way:

Take the difference between the diameters of the two holes, divide by two, and add the center distance. For holes of different diameter there will be a difference, but for equal holes the difference will be zero, so in that case the plug diameter for one hole will be exactly the center distance.

The method can be employed for checking center distances when the diameters are known, or for checking one of the diameters when the center distance is known. *D. E. Sweet, Marblehead, Mass.*



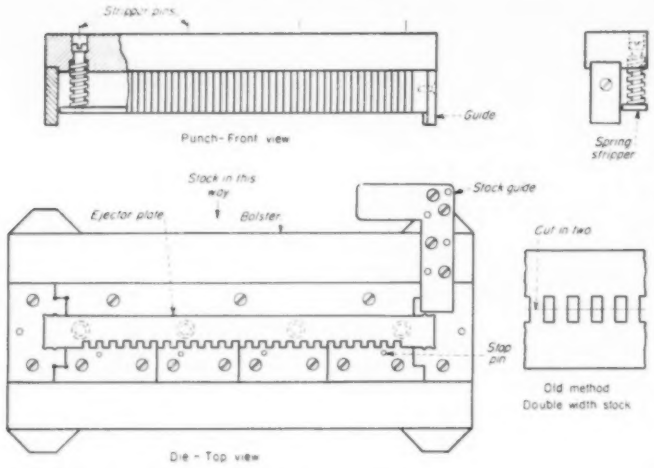
# Vise Bars Clamp Large Number of Round Parts

WHEN MILLING round bars, it is safe enough to hold two pieces at a time if the diameters do not vary much. Looseners in the vise equalize the clamping pressure.

To hold four pieces at a time, there are vise designs with equalizing bars and V-notches to even the pressure. This system could theoretically be expanded to hold a large number of parts, but the complications make it impractical.

To hold a large number of parts at one time in a vise for milling, a better way is the illustrated vise bars. The workpieces are actually clamped against other workpieces —the same size or smaller. The only end pressure is supplied by a step or notch at each end of the bar which carries the larger number of pieces.

When the vise is closed, the bars adjust themselves and equalize clamping pressure automatically. *R. Mery, Farmingdale, L. I., N. Y.*

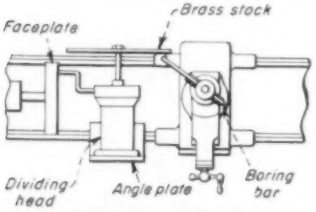



## Notched Stock Cut in Press With Multiple-Die Formation

SHEET METAL with notched edges has been produced for many years by a method suggested in a recent section of Practical Ideas by S. Framurz of Bombay, India. This method involves notching out rectangular slots, and then cutting the strip in half. However, some difficulty was experienced in cutting the strips in half, so a new method was devised.

Our notched stock had to be produced in various lengths, but all the notches were to be the same size; so a press tool was designed to accommodate the longest strip. Stock is fed in sideways and is notched by a series of long punches. A stock guide on one side of the die lines up the strip. The other end is open.

The dies were built up in sections and screwed together. The upper die was provided with a stripper and guides that insured accurate notching during each press stroke. *C. Jaikens, Boothtown, Halifax, England.*




### Index-Head Setup Produces Turned Spiral in Plate

HERE IS a difficult job that had to be done recently. A spiral had to be cut at a pitch of 1 in., starting at a point 5 in. from the center of the brass plate.

Not having a scroll-cutting machine available, I attempted the job on a lathe with the following setup: First an angle plate was clamped to the front way of the lathe and an indexing head was bolted to it with the index-head handle centered in the headstock centerline. The handle was attached to the faceplate so the faceplate revolved the head spindle through the gearing.

A special stud was made to hold the brass plate to the indexing spindle, and a boring bar with a V-shaped toolbit was mounted on the lathe slide. The leadscrew was engaged for a trial cut.

Now all that was necessary was to coordinate all the movements. The gearing was figured out like this: The faceplate had to turn 40 times to revolve the brass plate once, during which time the boring bar had to move in. This meant that a 40-tpi setup on the leadscrew would produce the required spiral, which was started after the toolbit was located 5 in. from the center of the plate. *Bernard Levowich, Brookline, Mass.*

### End Mill Made From Drill

DURING a rush milling job, the only 3/16-in. end mill in our shop was broken. By modifying a No. F 2 HSS combination center drill, we managed to continue production until the job was completed.

A 10° fishtail was ground into the face of the drill after the end had been ground off. *S. Bendick, Brooklyn, N.Y.*

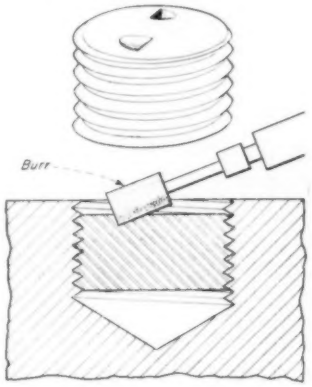
### Notch-Grinding Helps Remove Broken Studs and Screws

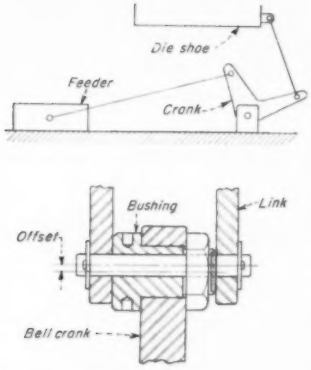
BROKEN screw heads, especially ones made from hardened steel, can be removed from tapped holes in a number of ways—all difficult. This method may work when others fail:

Mount a small, square-end grinding burr on an electric grinder.

Grind one or more notches in the surface of the screw—locate them near the edge with the flat ground surface in the direction the screw must turn to come out.

Take a pin punch and strike the notches in succession until the screw has been driven out enough to be gripped by pliers. *Ray Cafiero, Brooklyn, N.Y.*






### Eccentric Bushing Adjusts Bell-Crank Throw

PUNCH-PRESS STOCK had to be fed into the press at an even rate on a recent job, but also had to be adjustable over and under the part size by 3/16 in., too. The adjustable linkage we added to the shop-built mechanism is illustrated. The connecting links are represented by straight lines. Actually they were strong rods.

A bell crank acted as an intermediate link, imparting motion from the upper die shoe to the feeder mechanism. As the shoe rose, the stock feeder was moved to the left.

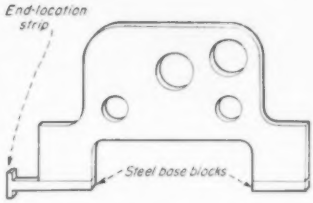
The connection from the bell crank to the stock-feed link was made through an eccentrically drilled bushing. The bushing was a snug fit in the bell crank, and was tightened to the crank by a jam nut on its threaded end after the bushing was rotated to the correct position. Resetting was done by loosening the nut, rotating the bushing to a new position, and tightening the nut again. The bushing can be graduated so the marks can be matched to an index mark on the crank for definite throws. *C. F. Brown, Willow Grove, Pa.*

### Pressed-Wood Templets Line Up Gear Boxes on Planer

FIVE gear boxes for Blanchard machines are lined up and planed at one time on a large planer setup. Locating these boxes was a troublesome job, because the operator had to employ a surface gage and a good eye to get all the edges and cored holes lined up. It is fairly important that all the boxes should be located accurately so the faces and edges will be machined within close-tolerance relationship to the centers of the cored holes.

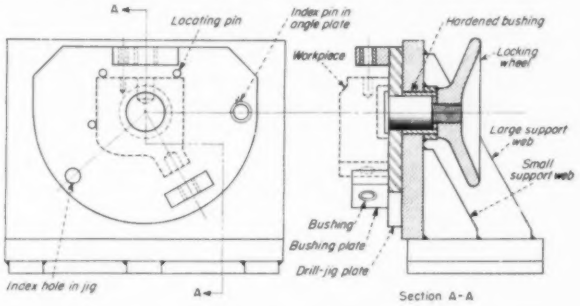
A new line-up method employs a couple of pressed-wood templets. They are cut out on a bandsaw to the cross-sectional shape of the boxes, and the cored holes are duplicated in the templets by boring. Cold-rolled-steel bottom pieces are added so the templets will stand up, and a small locating strip—that will fit on the edge of one of the T-slots in the planer table—is added to each templet on one of the bottom strips.

Now the operator locates the two templets in relation to the T-slot, at each end of the planer




table—perpendicular to the line of travel. The five boxes are set down and lined up by eye alone—the operator peers through one templet's holes, and adjusts the boxes until he can see that the cored holes are lined up with both templets. Finally he clamps down and starts work.

The new method speeds up the setup, and makes it more accurate. In addition, inspection can be made with the same templets. *David T. Lyons, Sr., Belmont, Mass.*



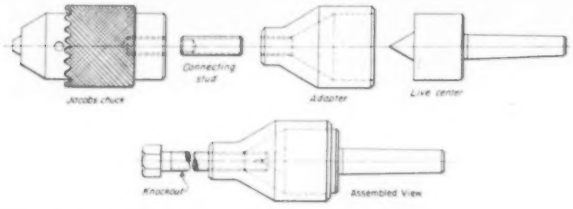

## Rotating Fixture on Angle Plate Indexes Parts for Drilling

A MASTER indexing angle plate will eliminate the expense of making complicated box jigs for tumbling fixtures when several workpieces call for holes to be drilled at various odd-size angles.

The illustrated angle plate is of welded construction throughout, machined on bottom and front. A spindle hole is bored through the center, and one or more index holes are provided. Index holes, as well as the spindle bore, should be lined with hardened bushings to minimize wear.

The design of the drill jigs is simplified and the actual drilling operations are speeded. No baseplates or feet are required, as the jigs take the shape of a simple plate with locators, clamps, drill bushings, and their brackets. Index holes are provided at 90° offset with the drill bushings. A spindle is pressed into the drill jig's pivot point. This spindle is threaded on one end to receive the locking wheel or any desired locking mechanism. A stepped or straight index pin completes the job. For greater accuracy, a tapered index pin is advisable.

Quick indexing and locking makes this arrangement economical and reduces operator fatigue. *H. G. Frommer, Milwaukee, Wis.*




## Chuck Adapted to Live Center Holds Centerless Parts

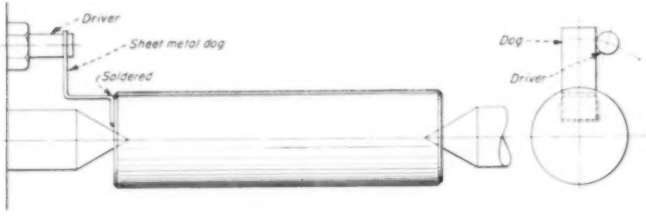
IN OUR MAINTENANCE department we frequently modify or repair parts that are not centered, or which have had the centered ends cut off. Such work is chucked on center in a Jacobs chuck held in an adapter.

The adapter is made to fit a live tailstock center, and is necessarily a special job. It should be a fairly tight fit on the OD of the center, but must not be so tight that it cannot be removed. The small hole through the chuck end of the adapter is tapped, so a standard hex bolt that has been center-drilled can be threaded in to force the tip of the center back to disassemble the adapter and center.

Normally the chuck is held by a small stud that screws into both adapter and chuck. If the chuck does not have a tapped hole, a pin can be turned down to press-fit into the chuck and threaded to assemble to the adapter.

Many different assembly combinations can be worked out to fit the requirements of each job—the important feature being that the adapter must hold the chuck's centerline right on that of the live center. For this reason, fits should be as close as possible.

Commercial chucks for this purpose are available with bronze jaws, but the shop-built adapter is cheap and the Jacobs-chuck jaws are tough. *Allan B. Nixon, Springfield, Mass.*




## Sheet Metal Dog Drives Shaft

WHEN GRINDING the OD of round shafts that must be held to close tolerances, it is always best to do the job in one pass. Grinding half the shaft, then turning it around and setting up again between centers will more than likely cause ridges or throw the work out of concentricity.

This dog takes the place of a conventional driving dog, yet permits the grinding wheel to pass over the entire shaft in one pass. It is bent to shape and soldered to the end of the shaft on the grinder. Care is taken to keep the dog inside the finished OD that is to be ground. The dog engages the driving pin in the faceplate of the grinder head so the shaft will rotate uniformly. The dog must be made of thick enough metal so the starting torque of the head will not break or bend it.

After the shaft is ground, the dog can be knocked off without the least damage to the shaft. *Roger Isetts, Kenosha, Wis.*

**$25** *In addition to regular payment*

## for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

**PAYMENT**—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

**JUDGES** — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

**REQUIREMENTS**—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

**WHO MAY ENTER** — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

**HOW TO ENTER**—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

88th Winner:

Ray Cafiero

Drilled Capscrews

# *The* Labor Union Monopoly Bites *ALL* Workers

*What kind of government is it which:*

**. . . Prosecutes the Great Atlantic & Pacific Tea Company which it asserts handles about 6½% of the retail food distributing business as an illegal monopoly in restraint of trade, and**

**. . . Seeks to break up four big meat packing companies and make them into 14 companies, charging the four with being a monopoly in restraint of trade, but**

**. . . Makes no move whatsoever to apply the federal anti-trust laws to the exercise of virtually 100 percent monopoly control of labor in the coal industry, and the only slightly less complete monopoly control of labor in the steel industry?**

The answer to that question is simple. It is class government of the most flagrant type, a government by which special privileges are dispensed without justice and to the great injury of all workers. It is the kind of government which will lead to the early sacking of the American enterprise system and the personal freedoms of workers.

In legal terms the explanation of this flagrant affront to good government is also simple. In 1932 labor union activities were given virtually complete exemption from the application of the federal anti-trust laws by passage of the Norris-LaGuardia Act.

continued on next page

When the Norris-LaGuardia Act was passed labor unions were relatively weak. Only about 16% of the nation's industrial workers were organized, only about 12% of the steel workers. About two-thirds of the coal miners were union members, but only half that number were paying dues. The country was in the depth of its worst depression. The unemployment of about one-fourth of the labor force made monopoly control by labor seem so remote as to be almost fanciful.

But after only seventeen years devoted to the promotion of labor union organization by the federal government, we have labor monopoly with us. In its power and scope it makes the alleged business monopolies being prosecuted under the federal anti-trust laws seem positively piddling. In its manners it makes the old-time business monopolists look like Lord Fauntleroys.

What is lacking, grievously lacking, is action by Congress; action to shape our federal anti-trust laws to take account of the labor monopoly that has become the dominant national force in our country today—a force that is leading to the loss of freedom of all workers.

**Before labor monopoly is broken up, as it must be broken up if our economy is not to be permanently wrecked, other steps will no doubt be required. But one test more than any other will be the touchstone of the nation's determination to keep its economic and personal freedom. It is what it does to see that labor monopoly receives the same treatment under the federal anti-trust laws as any other kind of economic monopoly.**

The purpose of the federal anti-trust laws is to break up monopoly and preserve fair competition in the United States. It is a fine purpose. The wisdom and fairness of its application in particular cases is often open to challenge. But in spite of bad administration every farsighted business man I know is a staunch defender of our national anti-trust policy.

At present, in the exemption of labor monopoly, we have a breach in that policy which, if not closed, will soon become fatal both to the policy and the enterprise system it is designed to foster and protect.

The main thing wrong today with Great Britain and indeed all Europe is that no effective anti-trust laws are in existence to protect the public from business and labor monopolies, to guarantee personal freedoms. No free economy in Europe or America can prosper as long as protected monopolies remain and flourish.

**While your representatives in Congress are home with you talk to them about the special privileges now granted to labor union monopoly. You would serve your country well by finding out what they intend to do about it before it is too late.**

*President, McGraw-Hill Publishing Company, Inc.*

# NEWS OF METALWORKING

## Upsurge of Orders Expected Here From $1.3 Billion Arms Aid Program

WASHINGTON—Manufacturers of military materiel, machine tool makers, and other "hard goods" suppliers to the military, are bound to get an upsurge of orders during the new year or so.

The orders will result from the draining of the U.S. armed forces stockpile of weapons toward Europe and Asia. Congress has voted, and the President approved an appropriation of $1,314,010,000 in arms aid for our friends abroad. In addition, another $450,000,000 worth of surplus military gear will be sent over.

Part of the billion dollars established for North Atlantic Pact countries' defenses will consist of weapons already on hand in U.S. munitions storehouses. These will be sent to Europe immediately, then be replaced (for our use) in the future with more modern versions. Cost of replacement will be charged against the arms aid program. American manufacturers will get that business.

Another part of the appropriation will be spent here in procuring weapons and equipment not now available in our reserve. Some of this money will be spent in this country.

**Build Up Foreign Munitions**

A third part of the arms aid program will be directed into the building up of the foreign ability to produce munitions and materiel. Most of this will consist of machine tools and industrial equipment designed to modernize and speed up the present European system of munitions making.

It is in this department that there is some doubt about how much of the money made available will go to American manufacturers. Hints from the Pentagon in the past few weeks indicate that there is a strong policy trend toward spending dollars, allocated to tools and equipment, in those foreign countries able to produce those tools.

Thus the "spend it over there" policy will have a two-fold effect upon Europe. First, it will enable Europeans to get the increased ability to produce their own munitions. Second, and equally important from the State Dept.-ECA angle, is the fact that dollars spent over there in procurement of tools will strengthen the European economy and cement intra-European relations somewhat.

A high-brass committee of Allied general staff officers is now working on an integrated defense plan for Europe. This will be submitted to the President within a few months. There is a necessity for speed in the development of this plan because Congress has tied a string to the cash allocated for the program. Of the $500,000,000 cash money allocated for aid to the North Atlantic Pact countries, only one-fifth can be spent immediately. The other $400-million can not be released until the President receives and approves the integrated defense plan.

The overall appropriation for arms aid is broken down as follows: For pact countries—$500-million in cash —another $500-million in contract authority. For non-pact nations—$314,010,000.

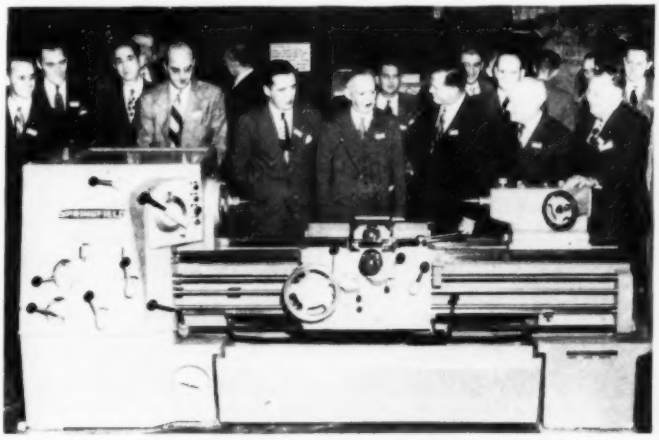
Just how much will be spent on industrial equipment for foreign munitions works is a military secret. Military missions have just left this country, bound for Europe, with the job of finding out just how much equipment is needed to give the munitions makers a boost.

### British Going 'All Out' For Canadian Tool Market

TORONTO—Arrangements have been completed for an all out effort to redirect a substantial proportion of British machine tool and scientific instrument exports to the dollar markets, spearheaded by a mammoth exhibit at the 1950 Canadian International Trade Fair to be held here May 29-June 9.

Member firms of seven British trade associations have already reserved a block of exhibit space in excess of 35,000 sq ft at the Fair.

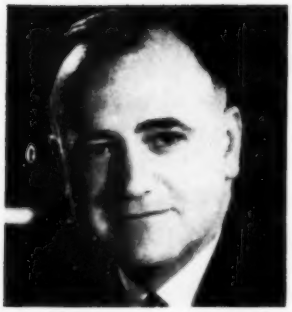
To meet this new Canadian competition, it is expected that more United States firms will seek to participate in the 1950 Trade Fair. Except for their Canadian subsidiaries and affiliates, U. S. machine tool builders were not heavily represented in last year's Fair.



***NEW SPRINGFIELD LATHE.*** *the 16 in. Model "S", was shown recently to distributors of Springfield Machine Tool Co., Springfield, Ohio. Here, immediately behind the lathe, are Robert L. Giebel, president of Giebel, Inc., New York (fourth man from left); Springfield Machine Tool officials F. M. Montanus, secretary; Paul A. Montanus, president; and R. C. Montanus, vice president. Second man from the right is Alexander G. Bryant, vice president, Cleereman Machine Tool Co., Chicago*

DAVID AYR, new NMTBA President

R. E. LeBLOND, 1st vice president



F. L. BLACKALL, JR., 2nd v.p. & director

# Upturn in Machine Tool Sales Predicted by NMTBA Head

## Unions Don't Permit Full Machine Output, Claim

WHITE SULPHUR SPRINGS, W. Va.—The general public is not getting the benefit of advances in machine tool design because of union restrictions upon production, Lloyd D. McDonald, president, National Machine Tool Builders' Assn. and vice president, Warner & Swasey Co., charged at the forty-eighth annual meeting of the NMTBA at The Greenbrier Nov. 17-18.

"Today," Mr. McDonald said, "we see the amazing spectacle of machine tool operators, under leadership of union stewards, holding down output of new machines to a mere fraction of the productivity built into them. The result is that people are paying more today than they should for many of the things they buy, in view of the methods at hand for producing them faster and cheaper.

"One would think that sooner or later union men who are preaching the philosophy of fear of the new machines would realize they are defeating their own objectives, for limitations on productivity lead either to inflation or unemployment."

### Barriers to Tool Buying

Mr. McDonald cited three barriers to purchase of modern and far more productive machines than metalworking plants now have:

1. Section 102 of the Internal Revenue code, which makes a company hesitate to build up reserves for equipment replacement for fear it may suffer a tax penalty upon the charge of improper accumulation of surplus.

2. The system of double taxation of earnings, whereby total profits of the corporation are taxed first, and then stockholders are taxed on such dividends as are paid out of the remainder.

3. The present policy of the Internal Revenue Department with respect to depreciation schedules.

"As matters stand today," Mr. McDonald declared, "it is impossible for a company to gain out of depreciation allowances the funds sufficient for replacement." Sheer economic necessity, he predicted, will dictate an upturn in machine tool sales.

"The facts show in our industry that on the average, owing to our rate of improvement, a machine tool model is rendered obsolete within about seven years after its introduction; and certainly I doubt whether most companies in doing replacement arithmetic reckon the anticipated profitable life of a new machine at more than ten years.

### Government Insists on 20-Year Rate

"But government, in most cases, insists upon depreciation over at least a 20-year period. Half of the funds needed for replacement, therefore, can come only out of earnings after taxes. It is this factor which, in my opinion, is the primary brake upon replacement today."

Mr. McDonald warned that if plant requirement does not take place, "there lies ahead of us only the dual spiral of inflation and government control. If people cannot get what they have been led to expect from the competitive system and from free enterprise, they will turn to government; and there is only one end to that road. It is the loss of the freedom of the individual upon which this republic was founded.

"It is paradoxical that our government devotes so much initiative to plans for building industrial and financial strength abroad, but ignores the necessity for upholding the industrial might of America," said Alexander G. Bryant, chairman, government relations committee, and vice president of Cleereman Machine Tool Co.

### Recovery Program Outlined

He emphasized that the time has come to think of an American recovery program which consists of three main points:

1. Guide every step of our foreign policy along roads that will require our aid to be used for establishment abroad of only those industries that will utilize available local resources and will not merely duplicate facilities which already exist in this coun-

### New Officers Elected at 48th Annual Meeting

David Ayr, president, Hendey Machine, Torrington, Conn., was elected president of the NMTBA at the annual meeting. Richard E. LeBlond, president, R. K. LeBlond Machine Tool Co., Cincinnati, was elected first vice president; Frederick L. Blackall, Jr., president, Taft-Pierce Mfg. Co., Woonsocket, R. I., was elected second vice president, and Jerome A. Raterman, president, Monarch Machine Tool Co., Sidney, Ohio, was named treasurer.

R. W. Glasner, president, Clearing Machine Corp., Chicago, was elected a director of NMTBA, as were Mr. Blackall and Mr. Raterman.

Mr. Ayr, who took office as president at the conclusion of the annual meeting here, received his early training at Brown & Sharpe Mfg. Co., Providence, R.I. Later he was associated with the Pierce-Arrow Motor Car Co. at Buffalo, and in 1924, with the Pratt & Whitney Div. of Niles-Bement-Pond Co. as works manager. He was elected president and general manager of Hendey Machine Co. in 1932.

*J. A. RATERMAN, treasurer and director*

*R. W. GLASNER, new NMTBA director*

try. Encouragement should be given American investment abroad only when such developments are needed to supply requirements which cannot be filled efficiently from U. S. factories.

2. Stimulate rehabilitation of the American industrial plant by modernizing Internal Revenue's archaic regulations on depreciation of capital equipment.

3. Substitute in government a constructive attitude of reassurance to industry that efficiency and well-earned profits are to be encouraged, in place of current policies which heckle business. Eliminate, for example, the evils of double taxation.

**Replacement Needed**

If the metalworking plants of this country replaced their machine tools that are over 20 years old by new models, this alone would generate a volume of machine tool business larger than three years' output of the entire industry at present rate of operations, NMTBA members were told by Burnham Finney, editor, AMERICAN MACHINIST.

He based this conclusion upon the just-completed Mid-Century Inventory of Metalworking Equipment conducted by AMERICAN MACHINIST.

"This survey shows," Mr. Finney said, "that at least 95% of the machine tools in use today are more than 10 years old in design; over 20% were actually built over 20 years ago; and if rate of replacement is not accelerated by 1955, three out of four of the machines installed in American factories will be at least 10 years old.

**Four Acceleration Factors**

"Fortunately, four factors point today toward replacement acceleration:

"1. The pressure of high wages, heavy taxes and competition. Today, in many cases, the only way a manufacturer seeking to hold, or expand, markets, can cut costs is by increasing productivity. Today's new machine tools average in productivity at least 33% higher than the prewar models which now constitute 95% of the nation's equipment.

"2. Accumulated wear and tear on existing machines. During the war, many of these machine tools took a severe beating. Some of them simply cannot be operated much longer.

"3. A growing awareness upon the part of people in Government that present depreciation policies of the Internal Revenue Dept. are acting as a deterrent to plant modernization; and the expectation of remedial legislation.

"4. The development by the machine tool industry of a method of replacement arithmetic which will show the banker, the controller, and the 'financial man on the board' potential results in terms of realized yield on invested capital."

## Railroad Shop Equipment Is Obsolete, ASME Hears

NEW YORK—More glamor and less drudgery in the service and repair shops could be just what the doctor ordered to better the plight of the railroads, the American Society of Mechanical Engineers heard Nov. 30 at its 70th annual meeting at the Hotel Statler here.

By "glamor" he meant modernization or mechanization of the locomotive and car repair facilities, Stevens H. Hammond, president of Whiting Corp., Harvey, Ill., told the engineers at a railroad and materials handling session.

He said that about 75% of shop and terminal machinery and equipment is not only obsolete but is definitely unsuited to compete in today's race even with machine tools and mechanical facilities of ten years ago, let alone the high-capacity, labor-saving units that have been developed during the past five years.

Mr. Hammond was one of the several speakers at many technical sessions of the ASME meeting, which will be fully covered by AMERICAN MACHINIST editors in the next issue.

## Automobile Body Engineers Meet

DETROIT—Exhibits at the annual technical convention of the American Society of Body Engineers at the Rackham Memorial Bldg. here Nov. 2-4 previewed what may be expected a year or two from now in the automobile industry.

Technical papers gave consideration to auto body styling, small cars, body materials, quality control, production engineering, body fabrication methods.

George A. Tinnerman, vice president of Tinnerman Products, Inc., Cleveland, presented a paper, "Elimination of Material Handling Through the Use of Self Retaining Fasteners." He showed two new types of fasteners which had been developed, and pointed out the ease with which direct progressive assembly can be obtained by use of these fasteners, which can be applied without resort to press or welding operations on the assembly line.

**Speed Nuts Used**

One development of this kind noted is the use of "speed nuts" for insertion in a box-type frame instead of welding captured nuts inside it before assembly of the two channels.

Presstite Engineering Co., St. Louis, introduced at the exhibits two new products—an anti-squeak tape and a new elastic compound gasket which replaces the conventional cork type. The anti-squeak tape sticks to metal and is soft enough for the assembler to poke a bolt through it, so it does not have to be formed. It is merely stuck in place on one surface.

Owens-Corning Fiberglas Co. exhibited fiber-reinforced polyester plastics for use in washing machine tubs, and as floor coverings for taxicabs. They have the quality of being sticky when wet so that passengers are not likely to slip on them.

**New Screwdriver**

A new hopper-fed power screw driver with automatic torque control was exhibited by Shakeproof, Inc., Chicago. The screw driver permits partial insertion of screw, and the screw may be dropped out of the carrier and then driven home where the hole is close. Screws may be inserted in the bottom of cup-shaped pieces.

Woodall Industries, Inc., exhibited a full line of wall and head trimming for auto bodies and examples of what they can do with plastic trimming materials if the industry is willing to pay the price. However, the principal use of these laminates of cloth or woven fiber in full color apparently have found a market in portable radio housings rather than in autos.

# Volta Redonda Success Paves Way For Mechanical Industry in Brazil

NEW YORK—While Brazil has a long way to go in achieving an adequate mechanical industry, the Volta Redonda steel plant proves that the job can be done if the right management tackles the problem. This is the observation of R. E. W. Harrison, consulting mechanical engineer, recently returned from visits to Brazil and Argentina.

The Volta Redonda steel plant, Mr. Harrison said, is "a thoroughly modern installation," with all the aspects of high efficiency demonstrated in the production of 250,000 tons of a wide variety of steel during the last twelve months.

"I was particularly impressed," he stated, "with the severity of the inspection of the finished products, and the relatively few rejects."

According to Leighton F. Korb, the plant's American superintendent, the plant had run continuously three eight-hour shifts per day, seven days per week, to turn out the tonnage mentioned, and the company could have disposed of another 100,000 tons of similar products had the facilities for making this additional tonnage been in existence at that time.

All of this, Mr. Harrison pointed out, adds up to the fact that Brazil is definitely in the steel business in a big way, producing good products on a reliable delivery schedule.

The policy of the Brazilian government, he noted, is to foster domestic manufacturing of a great many mechanical items now imported. Imposition of a scale of tariffs, which will automatically generate a home industry, is progressing.

Money or credit for industrial modernization, expansion, or the creation of new industries is Brazil's outstanding problem, Mr. Harrison believes, after visiting a vast number of plants, including Navy and Army installations. "By and large," he said, "the recommendations made in the Abbink Report could go a long way to correcting the situation, if adopted."

"I am, however," he added, "deeply conscious of the fact that foreign capital secures business for foreign nationals much more readily than does conservative American capital. The reluctance of our private bankers to encourage venture capital investments automatically creates opportunities for our foreign competitors, in many cases where the original idea for the manufacture of a product or the provision of a service came from an American engineer."

Turning to Argentina, Mr. Harrison was "impressed by a vast country, rich in the products of the soil and richer still in the possession of a hard-working population."

Argentina is a food producing country, he noted, and under reasonable marketing conditions the world can use usefully more food than has ever been produced.

"The economy, however, is obviously unbalanced, because the citizen must import most of his hard goods today, and the world market being what it is, he does not get too much in exchange for his meat and cereals. He is determined to correct the situation."

***GIANT TRANSPORT,** the C-124 Globemaster II, was rolled from Douglas Aircraft Co.'s Long Beach plant in mid-November. The 175,000 lb four-engined cargo plane, carrying up to 50,000 lb of payload, will be the largest production transport aircraft in military service. Here the boxed cargo in interior of the plane is visible through clamshell doors in the nose. Twin ramps fold into fuselage. Electric elevator amidship provides additional loading facilities*

## Strikes Hurt Production Less Than Old Tools Do

BOSTON—This fall's loss of industrial production due to the steel and coal strikes is far less than the nation's loss of potential production due to the obsolescence of the country's machine tool equipment, Tell Berna, general manager of the National Machine Tool Builders' Assn., told members of the Boston chapter of the American Society of Tool Engineers here Nov. 10.

"A survey of metalworking production equipment just completed by the American Machinist," Mr. Berna said, "discloses that 43% of machine tools now in use are ten years old or older, and 95% are over 10 years old in design.

"Delay in replacing old machines by modern equipment that turns out more work for the consumer's dollar is a costly perpetuation of inefficiency." He added that we can never expect to resume "the trend toward better things for more people at lower cost unless the plants of America are re-equipped with machines that make this lower cost possible."

## French Study Metalworking Here

WASHINGTON—A six-week U.S. productivity study by representatives of France's machine tool and metalworking industry began Nov. 16. The 21-man group will concentrate on handling of materials, production control, work organization, design, job preparation, and labor-management relations. The first half of the study will be devoted to plant visits and seminars in Cincinnati. The remainder of the tour will consist of visits to industrial plants in other areas.

## Ductile Cast Iron Announced

CHICAGO—Industry now has available to it a new cast iron which, unlike ordinary cast iron, is not brittle but can be bent or twisted. Known as ductile cast iron, the product has several times greater strength than ordinary cast iron with greatly increased ductility and shock-resistance, according to International Nickel Co., New York, which has been granted the patents on the inventions. Facts about the new cast iron were made known by Don Reese, foundry expert and engineer, before the annual meeting of the Gray Iron Founders' Society held here recently.

***SENATOR ROBERT A. TAFT**, who recently made a trip through the plant of Sheffield Corp., Dayton, is seen here with Louis Polk, Sheffield president, as Mr. Taft examines a Precisionaire, a gage that can measure to a millionth of an inch by the flow of air instead of by air pressure*

# Aircraft Plants Hail $15 Million Appropriation as 'Shot in Arm'

LOS ANGELES — President Truman's signature on the $15,585,863 military appropriation, despite its provision for 1,400 instead of 1,800 new planes, is a shot in the arm for southern California aircraft plants.

The delayed appropriation slowed up contract awards to subsidiary plants—most of them in metalworking.

A roundup of southern California's aircraft industry now shows that all major plants are working two shifts, with the outlook for 1950 "generally good." All major plants have enough backlog to carry them through 1950, and one at least, Lockheed, claims orders through 1951. In brief:

Lockheed is working two shifts, employing 15,000 in its main plant, 3,000 more in subsidiary plants. Lockheed has 44 commitments for its Constellation, and has placed $42,000,000 worth of parts orders since the first of the year. Some $10,000,000 of these have been delivered.

Douglas' three plants, employing 18,500, are working two shifts and had a backlog of $188,363,000 in orders as of Sept. 1. Military aircraft makes up 94.3% of this backlog; 5.7% is commercial. On Nov. 1 it announced production of a new DC6B, which has the added power and capacity of the DC6A cargo ship, but is outfitted for passenger service. Douglas still must fill 30 orders each for its C124A, Globe Master, four-engined transport, and for the F3D Skyknight, a jet Navy fighter.

North American's three plants, working two shifts, and employing 16,577, had a June backlog of $238,000,000, "enough to carry us through 1950." Its production is 100% military, and there's a definite downtrend in employment. A year ago it employed 22,500 workers. Big layoffs came in January when Air Force cancellations forced the layoff of 500 and again in September, when a contract for 40 AJ1 carrier-based bombers was completed and 600 were laid off. North American is completely tooled up for the present, and unless new models come along—which won't happen for a year—present tooling can handle any additional contracts. The company has orders for about 1,000 military planes, some of them already delivered.

Northrop Aircraft has been hard hit again by cancellation of its modification programs on seven giant Flying Wings, but the company is just now in the preliminary stages of tooling up for 48 F89 Scorpion all-weather jet fighters, due for delivery next year.

**Tooling Up for F89**

Tooling up has already begun on the sub-assembly lines for the F89 with major assembly jigs to come later. In cancelling the Flying Wings, the government said it was considering increasing its order on the F89.

Ryan Aviation, San Diego, is producing a radio-controlled target ship, and doing subcontract work for major West Coast firms. Its backlog was $8,000,000 Oct. 1.

The major aircraft parts supplier picture was spotty; there were ups and downs, and some small manufacturers went out of business because of the long delay in signing of the military appropriations bill and the delay in aircraft contracts.

Manufacturers of heavy machinery were harder hit than light. One major subcontractor which normally employs 1,200 workers, with one-third of its production aircraft parts, has experienced a 75% decrease in contracts. This company, a major supplier of cabin superchargers for the DC6 and DC4—in addition to landing gears—admits that the military appropriations bill is a needed stimulant. For the last seven months this company's business has decreased at a rate of 10% monthly.

A metalworking company which makes light hydraulic parts expects good business for 1950 and is presently tooling up for heavier hydraulic work. This company, like some others, practically ceased aircraft parts production while the majors awaited the government's military appropriation. Had it not been for production other than aircraft, this concern admitted it might have been forced to close. However, it now expects a $750,000 contract.

# $5 Million in ECA Equipment Funds

WASHINGTON — ECA authorizations for machinery and equipment purchases by Marshall Plan countries during the first week of November totalled $5,620,000. Another $114,000 for vehicles was also authorized.

Since the ECA program got underway April 3, 1948, almost a billion dollars have been authorized to be spent by European nations for machinery, equipment, and transportation equipment. As of Sept. 30, $732,000,000 had been set aside for machinery purchases, and approximately $250,000,000 for vehicles and transportation equipment.

The week's purchase authorizations making up the $5.6-million were: Austria, $52,000 for agricultural equipment; Belgium-Luxembourg, $1,431,000 for metalworking machinery; France, $1,725,000 for construction and mining equipment, industrial machinery, generators and motors, engines and turbines, and electrical apparatus; Iceland, $225,000 for agricultural equipment, construction and mining equipment, engines and turbines, electrical apparatus, and industrial machinery; Ireland, $500,000 for industrial machinery; Norway, $2,452,000 for tractors, industrial machinery, construction and mining equipment, and generators and motors; Turkey, $72,000 for construction and mining equipment and electrical apparatus.

# Detroit

**STRIKE EFFECTS LINGER ON . . . 35,000 PONTIACS MONTHLY IS AIM**

**FORD BODY STRENGTHENED . . . SOME K-F PRINTS OUT FOR TOOLING**

**The steel strike** has come and gone, but the malady lingers on. Through the last half of November assembly lines lagged at many points, and they will continue to move haltingly for at least a few weeks into December.

Anticipated production showings in November were materially boosted when Ford found it could maintain a fair degree of production through the month, instead of going down before mid-month. The means: Welding sheets out of its own mill to supply the wide requirements which outside mills could not furnish. Costs of sheet welding of this sort are obviously too disproportionate to consider in normal circumstances, but as an expedient to keep the Rouge operating, the program had very worthwhile values.

The result of this move, not anticipated earlier in November, and of other near-desperate operations in the rest of autodom, was that volume in November did not fall badly away below the level of 100,000 assemblies a week. But fall it did, and the climbing in December will be slow.

### Field Inventories Reduced

One rather welcome result of the strike effects on production was the reduction of field stock inventories. They were climbing somewhat rapidly in October; and November afforded dealers a chance to bring them lower. This puts the companies in good shape to build at substantial volume levels after the turn of the year, without too great worry that dealers may become overstocked.

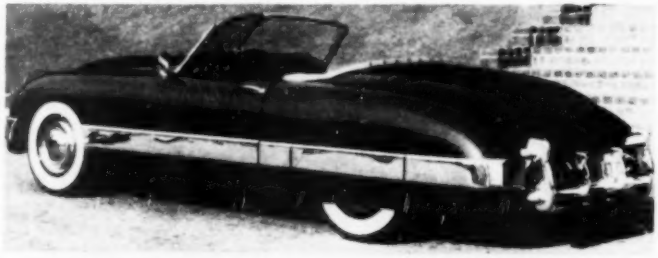
Some producers have big plans for the coming first quarter. Take Pontiac, for example. With its eye on fourth place in the auto industry (now held by a sister GM division, Buick) Pontiac is scheduling the highest manufacturing volume in its history for that time of year.

Installation of some $300,000 in new machine tools and equipment in the recent past will help the plant to run at a rate of about 35,000 assemblies per month after Jan. 1. Pontiac's ambitious schedules are aided by the fact that its retail outlets went into their new model year with ultra-small field stocks—no more than 15,000 or so, less than an average of four cars per dealer.

The new Pontiacs, which reached the buying public late in November, embody a variety of modifications from 1949 models. The major change is an increase in 8-cylinder engine horsepower from 104 to 108, achieved through increase of cubic inch displacement. A new, more massive grille is utilized in the 1950 models.

The 1950 Fords, introduced in mid-November, include a number of interior changes but—like Pontiac—few which are apparent on the outside. Bodies have been strengthened. Engines have been improved with a new type of piston in which expansion and contraction is controlled rather precisely, eliminating piston slap. A steel strut is cast into the aluminum piston; this controls expansion so the moving part cannot become tight when heated or loose when cold. One result has been the ability to fit the new pistons as close as 0.0005 in. clearance.

From Kaiser-Frazer, meanwhile, come developments which presage the new popular-priced car scheduled to appear in the spring. Some prints have been released for tooling. However, there are indications of perhaps overmuch hurry in these releases; a few producers have reported back to Willow Run that dimensions and other specifications are not complete enough to start the job off with assurance. Needless to say, these omissions are being remedied as rapidly as possible.



***SPECIAL ROTARY JIG** holds partly welded chassis of Kurtis-Kraft Sport Car, custom built in Glendale, Calif. To weld the bottom portions, chassis is removed from initial jig and placed in this rotating one. Heli-arc spot welding is used for the lighter welding jobs. Three welders and assemblers working on jig can turn out one custom-made chassis per day. The car sells for from $3500 to $4000, depending on what motor customers want—Rocket, Buick, Chrysler, or the standard engine, which is a Ford V-8, 100 hp. Racing models with special heads have attained 142 mph during tests at Muroc dry lake. Kurtis-Kraft Co., five of whose cars placed among the first ten at Indianapolis, expects to produce 250-300 custom built cars during 1950, is presently working on 25. The concern expects some export sales through its car-kit design, which allows the Sport Car to be shipped disassembled and unpainted for assembly abroad. The car-kit will cost approximately 25% less than the assembled model*

# Names in the News

David Lewis

**David Lewis** has been named general sales manager, Lycoming-Spencer Div., Avco Mfg. Corp., New York. He formerly was general manager of three operating divisions of Noma Electric Corp., New York.

**H. G. Erickson** has been named chief engineer of Texas Engineering & Mfg. Co., Inc., Dallas. **L. A. Childs, Jr.,** has been named assistant chief engineer.

**E. O. Howard** has been named sales engineer for Grinder & Titan Abrasive divisions of Charles H. Besley & Co., Chicago, with his territory including northern Illinois. For the past eleven years he has been manager of the Buffalo, N. Y. territory.

George Gorton III

**George Gorton III,** executive vice president and general manager of the George Gorton Machine Co., Racine, Wis., has accepted membership on the American Management Assn Production Council. Mr. Gorton is also president of Gormac Products, Racine; president, Racine National Metal Trades Assn.; board member, Assoc. of Commerce, Racine; member governing board, Racine Manufacturers' Assn.; and board member, Machine Affiliates, New York.

**Ray H. Timmons** has been appointed manufacturing manager of industrial products for Westinghouse Electric Corp., Pittsburgh. He was formerly manager of manufacturing for the company's Transportation and Generator Division at East Pittsburgh. **C. M. Clark,** formerly superintendent of manufacturing for that division, will succeed Mr. Timmons as manager of manufacturing.

**Ray O. Ryan,** manager of the Ft. Worth Division of Consolidated Vultee Aircraft Corp., San Diego, and **R. C. Sebold,** Convair director of engineering, have been elected vice presidents. Mr. Ryan has been in charge of B-36 bomber production since Sept. 1948, and will continue as Ft. Worth manager. Mr. Sebold, now vice president in charge of engineering, served as chief engineer of the Ft. Worth division up to last March.

**Stanley E. Cobbledick** has been named sales manager of the Franklin Steel Div., Borg-Warner Corp., Chicago. **Samuel W. Cherry** has been named superintendent of the Franklin, Pa., plant.

**James F. Crough** has been named western representative of the Hydraulic Power Div., Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.

**Louis R. Ripley** has been elected president of the Heli-Coil Corp., Long Island City, N. Y.

## Obituaries

**Karl B. Britton,** 66, who was closely associated with the development of the automobile industry, died Nov. 8. He was a recognized expert in automotive design and mechanics. For many years he was associated with Thompson Products, Inc., Cleveland. At the time of his death, he was vice president of Britton Controls, Inc., a group engaged in the development of automotive appliances.

**Charles E. Carpenter,** well known in machine tool circles for many years, died Oct. 21. He worked with Schuckart & Schutte in introducing the Pfauter gear hobber. After the outbreak of World War I he went to Paris as president of Allied Machinery Corp. He returned to this country before World War II, joining the British Purchasing Commission and remained with them during the war. Following the war he became New York representative for Lunden & Bonthron of Stockholm.

Milo F. McCammon

**Milo F. McCammon** has been named general manager, Stamford Div., Yale & Towne Mfg. Co., New York. He has resigned as general manager, Ingersoll Steel Div., Borg-Warner Corp., Kalamazoo, Mich. Previously he served as general production manager, South Bend Div., Bendix Aviation Corp., after serving 12 years with Hudson Motor Car Co.

**W. G. Rosendahl** has been elected vice president, Machine Tool Div., Hamilton-Thomas Corp., Hamilton, Ohio. **E. E. Baker** has been elected vice pres., Public Works Pump Div.

**Harry N. Bedford** has been named manager of production planning and control, Bausch & Lomb Optical Co., Rochester, N. Y. He succeeds **Milton D. Lemieux,** recently placed in charge of inventory control for the firm's affiliated companies and branch offices throughout the U.S.

**Stanley T. Goss,** 68, president of Goss & DeLeeuw Machine Co., Kensington, Conn., died Oct. 31.

A. J. Jennings

*Died Oct. 30, as noted in A.M. Nov. 17, p131. He was vice president in charge of sales of Cleveland Worm & Gear Co. and of its associate company, The Farvel Corp.*

# Westinghouse Sees Good Year Ahead

PITTSBURGH—1950 should be a good business year for Westinghouse Electric Corp., Gwilym A. Price, president, said at the Mid-Century Review and Forecast Forum conducted here by his company Nov. 10. He does not anticipate a dip in operations early in the new year, as he earlier expected.

Mr. Price pointed out that consumer goods demand, which fell off sharply last spring, had risen steadily the past few months and promises to continue at a brisk level well into 1950. Sales of refrigerators and of television and other electronic units, for example, have been excellent.

Industrial goods, too, are doing well and should stay at a reasonably satisfactory rate for many months, Mr. Price said. He indicated that his company's purchases of new production equipment next year would be determined by how much such equipment could cut manufacturing costs.

**More Automatic Controls Seen**

More and more automatic controls, many of them electronic, will become an important part of industrial equipment in the near future as industry finds it more imperative to increase the productivity of labor, Walter Evans, vice president, Westinghouse's Electronics and X-ray Dept., predicted in a paper read for him at the Forum.

On the subject of heat treating, Mr. Evans sees many metal-annealing tasks which in the years ahead "might be done, faster or better and at acceptable overall cost with electricity . . . instead of present fuel-fired ovens of acre size. Continuous heat treating of metal strip instead of by the present batch method would have considerable benefit."

The role of atomic power was pointed out by D. W. R. Morgan, vice president, in a paper read for him on "Central-Station Steam Power Generation." Mr. Morgan stated that "atomic power stands . . . as a potential means of furnishing heat for large production of electric energy by steam-driven turbines," but at the moment "central-station use of atomic energy is some years away, and no account can be taken of it in present station planning."

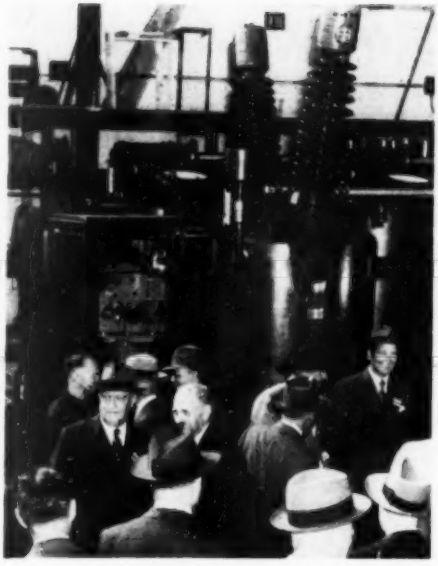
L. R. Ludwig, general manager, Buffalo Divisions, speaking on "Electrical Drives" saw as a long-range objective "a drive that is quite unlike that in any of today's catalogs. This will be a burn-out-proof motor. The windings, like the ball bearings of today's Life-Line motor, will have indefinite life. Moreover, it will have built into it complete thermal and overload protection. . . . The motor, furthermore, will contain within it its starting equipment. It will be a packaged drive in the full sense of the term . . ."

Cheaper production of power was envisioned by C. M. Laffoon, manager, A. C. Generator Engineering Dept., speaking on "The Evolution and Eventualities of Alternating Current Generation." He saw the possibility of using thinner insulation, permitting easier heat removal and reduced ventilation. "This sets off a chain of economies: smaller machines, lighter foundations, smaller buildings, and reduced overall investment."

**Better Systems Needed**

Summarizing the talks on the Forum program, over which he presided, A. C. Monteith, vice president in charge of engineering, said that "The needs of tomorrow call for better systems, smaller devices. Industry to maintain the increasing standard of living for our people, will find the energy content of its products growing. This will mean more automatic controls, higher speeds, new methods of fabrication and processing. We are confident that the research and development engineer, the designer, and the application engineer can produce these."

Other speakers at the Forum were J. B. MacNeill, manager of the Switchgear and Control Division, speaking on "The Development of Switchgear"; Frank Snyder, manager of the Transformer Division, on "The Transformer and How it Grew"; and Samuel G. Hibben, director of applied lighting, on "Light —Yesterday and Tomorrow."



*ALLIS CHALMERS' Boston works was honored by a four-day semi-centennial celebration recently. At a luncheon for some 150 leading utility, engineering and client guests of the company, President Walter Geist announced the intention to continue circuit breaker manufacturing at the plant for years to come. Here are shown Mr. Geist, left, middle row, wearing soft hat, and Executive Vice President W. C. Johnson, upper right, extreme rear, at inspection of assembly dept., with other employees*

# More Controls On Tool Exports

WASHINGTON—Virtually all metalworking machines, diesel and diesel-electric locomotives, mining and quarrying machinery, electrical generators and motors, electronic and x-ray equipment, many iron and steel mill products, and most strategic metals have been placed under more stringent export-destination controls by the Office of International Trade.

In a series of actions designed to increase the effectiveness of security controls on exports of strategic commodities, the OIT has ruled that more than 100 important commodity classifications must have validated export licenses for shipment to all destinations except Canada.

Among the classifications under the new restrictions are: power-driven metalworking machine tools (nonportable) and parts, including engine lathes, spinning lathes for bombs, boring lathes, vertical boring and turning mills, jig boring machines, shell tappers, tapping machines, automatic screw machines, milling machines, gear cutting machines, drilling machines, grinding machines, broaching machines (all types), honing and lapping machines (except gear), rifle-working machines; sheet and plate metalworking machinery specially designed for manufacturing ammunition; heavy duty presses; forging machinery and parts; continuous casting machinery; dynamic balancing machines.

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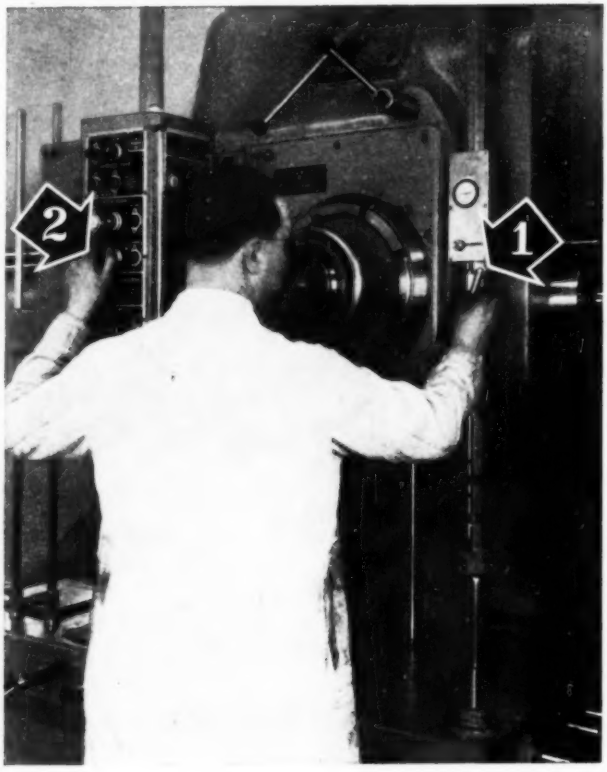
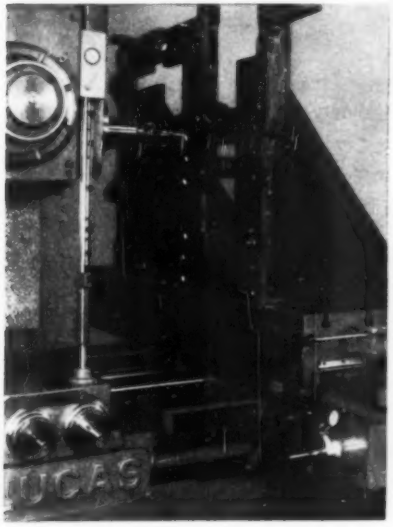
Here's how it works: First hole has been bored. At 1, (right) operator removes top rod of same length as distance to next operation. At 2, he




pushes the head down feed and rapid traverse buttons on movable pendant. Spindle head feeds down and is automatically positioned when dial indicator contacts end of next rod. Automatic positioning of the table is controlled by other end measuring rods and dial indicator which operate exactly the same way.

By using a machined surface as a basic reference point the operator can automatically position the center line of the spindle to the center line of any operation with extreme accuracy, *without the use of jigs or fixtures*. On production work it will positively repeat a series of drilling, boring and milling operations on any required number of pieces.

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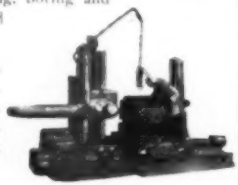

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American Machinist REFERENCE BOOK SHEET

# Simple Indexing...I

BY WM. H. SIEBRECHT 3rd, GENERAL PRECISION LABORATORY, INC.

The accompanying table avoids need for extended calculations to find the number of turns and crank travel required for any problem in simple, or plain, indexing. Further, instead of giving the angular distance between holes as divisions of a circle, the table is based on the distance between holes in the index plate in terms of degrees, minutes and seconds, as is common on engineering drawings. Therefore, the operator need not make a conversion. And a choice of index plates is frequently given in the tabulated figures, so that it is often unnecessary to change the plate already set up on the dividing head.

These tables are based on standard dividing heads with a 40:1 drive. With such heads, each turn of the crank moves the spindle through a 9° angle. Conversely, if spindle travel less than 9° is desired, the crank will have to move through less than one turn. How much it moves will be determined by the desired angle. All spindle angles less than 9° are expressed as crank travel in terms of index plate holes.

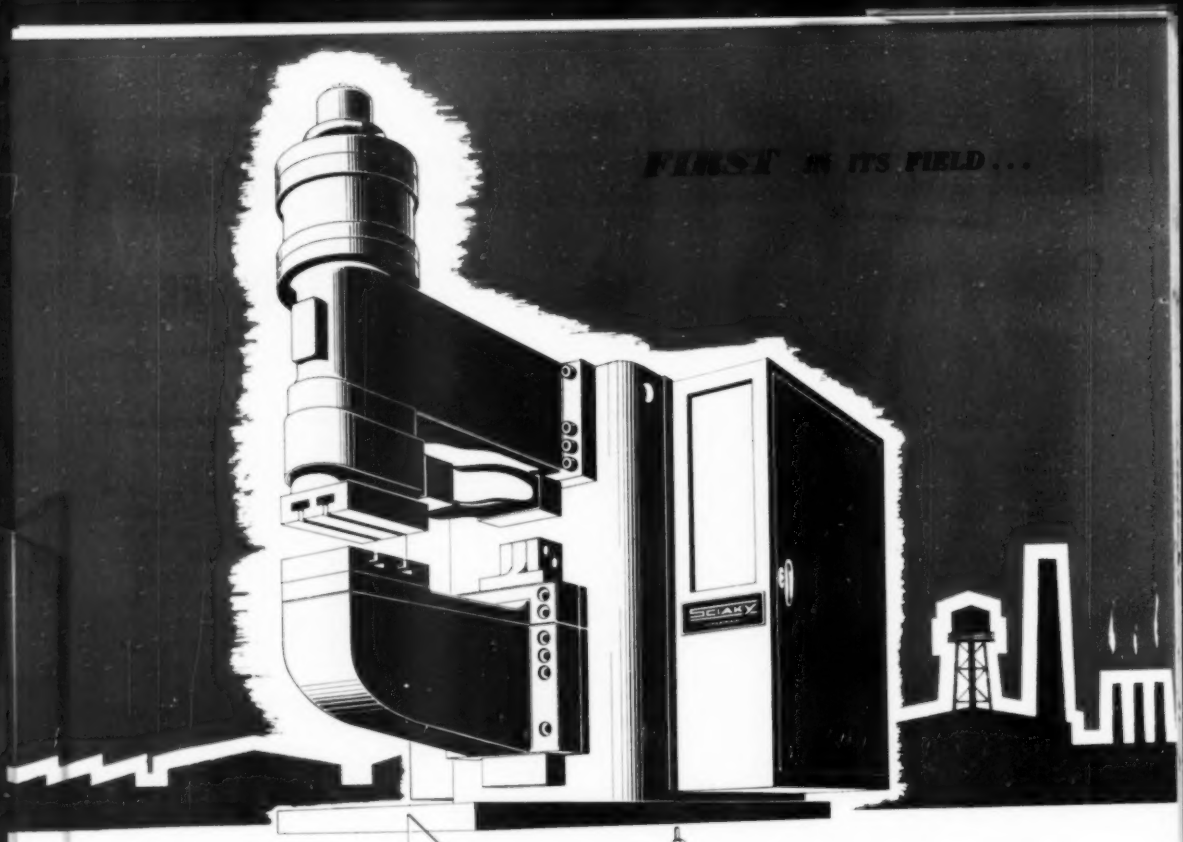
Values given in the tables are calculated from index plates with the following hole series: 15, 16, 17, 18, 19, 20, 21, 23, 24, 27, 28, 29, 30, 31, 33, 34, 37, 38, 39, 41, 42, 43, 46, 47, 49, 54, 58, 62 and 66.

The first column is the spindle travel in degrees, minutes and seconds. The second is the decimal equivalent. The last is the index plate and hole necessary to produce this angular displacement.

*Example 1:* Two holes 6.3000° apart are to be spotted on a circular piece of work. Referring to the table, this angle can be produced by using either the 14th hole in a plate with 20 holes or by the 21st hole in a plate with 30 holes.

*Example 2:* A plain cam is to be milled with a lobe that subtends an angle of 148° 40′ 00″. The number of turns of the crank is determined by dividing the angle by 9. The result is 16 turns plus 4° 40′ 00″. The 4° 40′ 00″ is read directly from the table as the 14th hole in a 27-hole plate or as the 28th hole in a 54-hole plate.

| Angle | Decimal Equiv. | Hole and Plate | Angle | Decimal Equiv. | Hole and Plate | Angle | Decimal Equiv. | Hole and Plate | Angle | Decimal Equiv. | Hole and Plate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° 8′ 11″ | 0.1364° | 1/66 | 0° 23′ 29″ | ditto | 2/46 | 0° 37′ 14″ | ditto | 4/58 | 0° 54′ 00″ | 0.9000° | 2/20 |
| 0° 8′ 43″ | 0.1452° | 1/62 | 0° 24′ 33″ | 0.4091 | 3/66 | 0° 37′ 40″ | 0.6279° | 3/43 | 0° 54′ 00″ | ditto | 3/30 |
| 0° 9′ 19″ | 0.1552° | 1/58 | 0° 25′ 7″ | 0.4186° | 2/43 | 0° 38′ 34″ | 0.6429° | 2/28 | 0° 55′ 6″ | 0.9184° | 5/49 |
| 0° 10′ 00″ | 0.1666° | 1/54 | 0° 25′ 43″ | 0.4286 | 1/21 | 0° 38′ 34″ | ditto | 3/42 | 0° 55′ 23″ | 0.9231° | 4/39 |
| 0° 11′ 1″ | 0.1837° | 1/49 | 0° 25′ 43″ | ditto | 2/42 | 0° 39′ 31″ | 0.6585° | 3/41 | 0° 55′ 52″ | 0.9310° | 3/29 |
| 0° 11′ 29″ | 0.1915° | 1/47 | 0° 26′ 8″ | 0.4355° | 3/62 | 0° 40′ 00″ | 0.6666° | 2/27 | 0° 55′ 52″ | ditto | 6/58 |
| 0° 11′ 44″ | 0.1957° | 1/46 | 0° 26′ 20″ | 0.4390° | 2/41 | 0° 40′ 00″ | ditto | 4/54 | 0° 56′ 51″ | 0.9474° | 2/19 |
| 0° 12′ 33″ | 0.2093° | 1/43 | 0° 27′ 00″ | 0.4500° | 1/20 | 0° 40′ 54″ | 0.6818° | 5/66 | 0° 56′ 51″ | ditto | 4/38 |
| 0° 12′ 51″ | 0.2143° | 1/42 | 0° 27′ 42″ | 0.4615° | 2/39 | 0° 41′ 32″ | 0.6923° | 3/39 | 0° 57′ 16″ | 0.9545° | 7/66 |
| 0° 13′ 10″ | 0.2195° | 1/41 | 0° 27′ 56″ | 0.4655° | 3/58 | 0° 42′ 38″ | 0.7105° | 3/38 | 0° 57′ 27″ | 0.9574° | 5/47 |
| 0° 13′ 51″ | 0.2308° | 1/39 | 0° 28′ 25″ | 0.4737° | 1/19 | 0° 43′ 33″ | 0.7258° | 5/62 | 0° 57′ 51″ | 0.9643° | 3/28 |
| 0° 14′ 13″ | 0.2368° | 1/38 | 0° 28′ 25″ | ditto | 2/38 | 0° 43′ 47″ | 0.7297° | 3/37 | 0° 58′ 23″ | 0.9730° | 4/37 |
| 0° 14′ 36″ | 0.2432° | 1/37 | 0° 29′ 11″ | 0.4865° | 2/37 | 0° 44′ 5″ | 0.7347° | 4/49 | 0° 58′ 42″ | 0.9783° | 5/46 |
| 0° 15′ 53″ | 0.2647° | 1/34 | 0° 30′ 00″ | 0.5000° | 1/18 | 0° 45′ 00″ | 0.7500° | 2/24 | 1° 00′ 00″ | 1.0000° | 2/18 |
| 0° 16′ 22″ | 0.2727° | 1/33 | 0° 30′ 00″ | ditto | 3/54 | 0° 45′ 57″ | 0.7660° | 4/47 | 1° 00′ 00″ | ditto | 3/27 |
| 0° 16′ 22″ | ditto | 2/66 | 0° 31′ 46″ | 0.5294° | 1/17 | 0° 46′ 33″ | 0.7759° | 5/58 | 1° 00′ 00″ | ditto | 6/54 |
| 0° 17′ 25″ | 0.2903° | 1/31 | 0° 31′ 46″ | ditto | 2/34 | 0° 46′ 57″ | 0.7826° | 2/23 | 1° 00′ 58″ | 1.0161° | 7/62 |
| 0° 17′ 25″ | ditto | 2/62 | 0° 32′ 44″ | 0.5454° | 2/33 | 0° 46′ 57″ | ditto | 4/46 | 1° 2′ 47″ | 1.0465° | 5/43 |
| 0° 18′ 00″ | 0.3000° | 1/30 | 0° 32′ 44″ | ditto | 4/66 | 0° 47′ 39″ | 0.7941° | 3/34 | 1° 3′ 32″ | 1.0588° | 2/17 |
| 0° 18′ 37″ | 0.3103° | 1/29 | 0° 33′ 4″ | 0.5510° | 3/49 | 0° 49′ 5″ | 0.8182° | 3/33 | 1° 3′ 32″ | ditto | 4/34 |
| 0° 18′ 37″ | ditto | 2/58 | 0° 33′ 45″ | 0.5625° | 1/16 | 0° 49′ 5″ | ditto | 6/66 | 1° 4′ 17″ | 1.0714° | 5/42 |
| 0° 19′ 17″ | 0.3214° | 1/28 | 0° 34′ 28″ | 0.5745° | 3/47 | 0° 50′ 00″ | 0.8333° | 5/54 | 1° 5′ 10″ | 1.0862° | 7/58 |
| 0° 20′ 00″ | 0.3333° | 1/27 | 0° 34′ 50″ | 0.5806° | 2/31 | 0° 50′ 14″ | 0.8372° | 4/43 | 1° 5′ 27″ | 1.0909° | 4/33 |
| 0° 20′ 00″ | ditto | 2/54 | 0° 34′ 50″ | ditto | 4/62 | 0° 51′ 26″ | 0.8571° | 2/21 | 1° 5′ 27″ | ditto | 8/66 |
| 0° 22′ 2″ | 0.3673° | 2/49 | 0° 35′ 13″ | 0.5870° | 3/46 | 0° 51′ 26″ | ditto | 4/42 | 1° 5′ 51″ | 1.0976° | 5/41 |
| 0° 22′ 30″ | 0.3750° | 1/24 | 0° 36′ 00″ | 0.6000° | 1/15 | 0° 52′ 15″ | 0.8710° | 3/31 | 1° 6′ 7″ | 1.1020° | 6/49 |
| 0° 22′ 59″ | 0.3830° | 2/47 | 0° 36′ 00″ | ditto | 2/30 | 0° 52′ 15″ | ditto | 6/62 | 1° 7′ 30″ | 1.1250° | 2/16 |
| 0° 23′ 29″ | 0.3913° | 1/23 | 0° 37′ 14″ | 0.6207° | 2/29 | 0° 52′ 41″ | 0.8780° | 4/41 | 1° 7′ 30″ | ditto | 3/24 |

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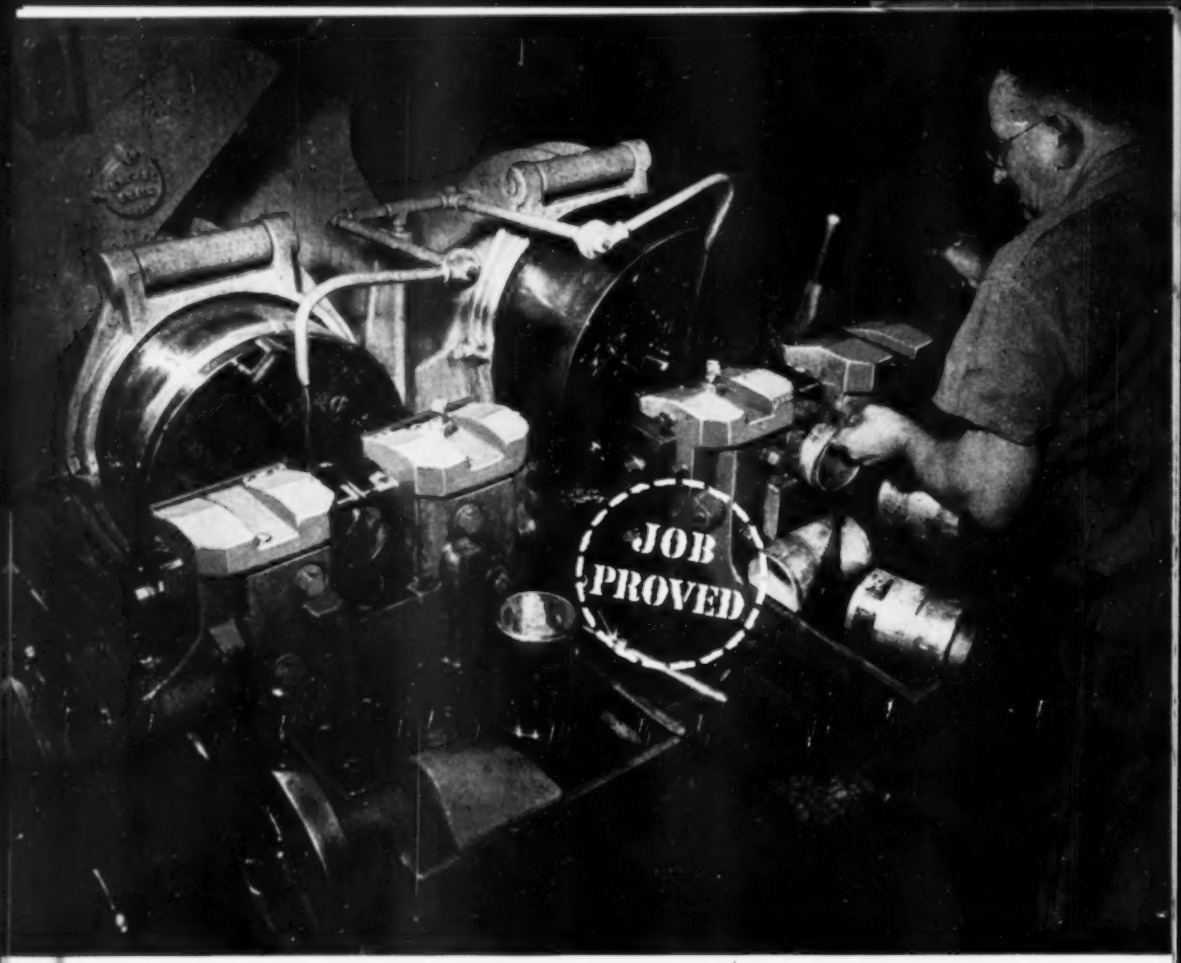
# Simple Indexing...II

| Angle | Decimal Equiv. | Hole and Plate |
|---|---|---|
| 1° 8′ 56″ | 1.1489° | 6/47 |
| 1° 9′ 14″ | 1.1538° | 5/39 |
| 1° 9′41″ | 1.1613° | 4/31 |
| 1° 9′ 41″ | ditto | 8/62 |
| 1° 10′ 00″ | 1.1666° | 7/54 |
| 1° 10′ 26″ | 1.1739° | 3/23 |
| 1° 10′ 26″ | ditto | 6/46 |
| 1° 11′ 3″ | 1.1842° | 5/38 |
| 1° 12′ 00″ | 1.2000° | 2/15 |
| 1° 12′ 00″ | ditto | 4/30 |
| 1° 12′ 58″ | 1.2162° | 5/37 |
| 1° 13′ 38″ | 1.2272° | 9/66 |
| 1° 14′ 29″ | 1.2414° | 4/29 |
| 1° 14′ 29″ | 1.2414° | 8/58 |
| 1° 15′ 21″ | 1.2558° | 6/43 |
| 1° 17′ 9″ | 1.2857° | 3/21 |
| 1° 17′ 9″ | ditto | 4/28 |
| 1° 17′ 9″ | ditto | 6/42 |
| 1° 17′ 9″ | ditto | 7/49 |
| 1° 18′ 23″ | 1.3065° | 9/62 |
| 1° 19′ 1″ | 1.3171° | 6/41 |
| 1° 19′ 25″ | 1.3235° | 5/34 |
| 1° 20′ 00″ | 1.3333° | 4/27 |
| 1° 20′ 00″ | ditto | 8/54 |
| 1° 20′ 26″ | 1.3404° | 7/47 |
| 1° 21′ 00″ | 1.3500° | 3/20 |
| 1° 21′ 49″ | 1.3636° | 5/33 |
| 1° 21′ 49″ | ditto | 10/66 |
| 1° 22′ 10″ | 1.3696° | 7/46 |
| 1° 23′ 5″ | 1.3846° | 6/39 |
| 1° 23′ 48″ | 1.3966° | 9/58 |
| 1° 25′ 16″ | 1.4211° | 3/19 |
| 1° 25′ 16″ | ditto | 6/38 |
| 1° 27′ 6″ | 1.4516° | 5/31 |
| 1° 27′ 6″ | ditto | 10/62 |
| 1° 27′ 34″ | 1.4595° | 6/37 |
| 1° 27′ 54″ | 1.4651° | 7/43 |
| 1° 28′ 10″ | 1.4694° | 8/49 |
| 1° 30′ 00″ | 1.5000° | 3/18 |
| 1° 30′ 00″ | ditto | 4/24 |
| 1° 30′ 00″ | ditto | 5/30 |
| 1° 30′ 00″ | ditto | 7/42 |
| 1° 30′ 00″ | ditto | 9/54 |
| 1° 30′ 00″ | ditto | 11/66 |
| 1° 31′ 55″ | 1.5319° | 8/47 |
| 1° 32′ 12″ | 1.5366° | 7/41 |
| 1° 33′ 6″ | 1.5517° | 5/29 |
| 1° 33′ 6″ | ditto | 10/58 |
| 1° 33′ 55″ | 1.5652° | 4/23 |
| 1° 33′ 55″ | ditto | 8/46 |
| 1° 35′ 18″ | 1.5882° | 3/17 |
| 1° 35′ 18″ | ditto | 6/34 |
| 1° 35′ 48″ | 1.5968° | 11/62 |
| 1° 36′ 26″ | 1.6071° | 5/28 |
| 1° 36′ 55″ | 1.6154° | 7/39 |
| 1° 38′ 11″ | 1.6364° | 6/33 |
| 1° 38′ 11″ | ditto | 12/66 |
| 1° 39′ 11″ | 1.6531° | 9/49 |
| 1° 39′ 28″ | 1.6579° | 7/38 |
| 1° 40′ 00″ | 1.6666° | 5/27 |
| 1° 40′ 00″ | ditto | 10/54 |
| 1° 40′ 28″ | 1.6744° | 8/43 |
| 1° 41′ 15″ | 1.6857° | 3/16 |
| 1° 42′ 10″ | 1.7027° | 7/37 |
| 1° 42′ 25″ | 1.7069° | 11/58 |
| 1° 42′ 51″ | 1.7143° | 4/21 |
| 1° 42′ 51″ | ditto | 8/42 |
| 1° 43′ 24″ | 1.7234° | 9/47 |
| 1° 44′ 31″ | 1.7419° | 6/31 |
| 1° 44′ 31″ | ditto | 12/62 |
| 1° 45′ 22″ | 1.7561° | 8/41 |
| 1° 45′ 39″ | 1.7609° | 9/46 |
| 1° 46′ 22″ | 1.7727° | 13/66 |
| 1° 48′ 00″ | 1.8000° | 3/15 |
| 1° 48′ 00″ | ditto | 4/20 |
| 1° 48′ 00″ | ditto | 6/30 |
| 1° 50′ 00″ | 1.8333° | 11/54 |
| 1° 50′ 12″ | 1.8367° | 10/49 |
| 1° 50′ 46″ | 1.8462° | 8/39 |
| 1° 51′ 11″ | 1.8529° | 7/34 |
| 1° 51′ 43″ | 1.8621° | 6/29 |
| 1° 51′ 43″ | ditto | 12/58 |
| 1° 52′ 30″ | 1.8750° | 5/24 |
| 1° 53′ 1″ | 1.8837° | 9/43 |
| 1° 53′ 14″ | 1.8871° | 13/62 |
| 1° 53′ 41″ | 1.8947° | 4/19 |
| 1° 53′ 41″ | ditto | 8/38 |
| 1° 54′ 33″ | 1.9091° | 7/33 |
| 1° 54′ 33″ | 1.9091° | 14/66 |
| 1° 54′ 54″ | 1.9149° | 10/47 |
| 1° 55′ 43″ | 1.9286° | 6/28 |
| 1° 55′ 43″ | ditto | 9/42 |
| 1° 56′ 45″ | 1.9459° | 8/37 |
| 1° 57′ 23″ | 1.9565° | 5/23 |
| 1° 57′ 23″ | ditto | 10/46 |
| 1° 58′ 32″ | 1.9756° | 9/41 |
| 2° 00′ 00″ | 2.0000° | 4/18 |
| 2° 00′ 00″ | ditto | 6/27 |
| 2° 00′ 00″ | ditto | 12/54 |
| 2° 1′ 2″ | 2.0172° | 13/58 |
| 2° 1′ 13″ | 2.0204° | 11/49 |
| 2° 1′ 56″ | 2.0323° | 7/31 |
| 2° 1′ 56″ | ditto | 14/62 |
| 2° 2′ 44″ | 2.0454° | 15/66 |
| 2° 4′ 37″ | 2.0769° | 9/39 |
| 2° 5′ 35″ | 2.0930° | 10/43 |
| 2° 6′ 00″ | 2.1000° | 7/30 |
| 2° 6′ 23″ | 2.1064° | 11/47 |
| 2° 7′ 4″ | 2.1176° | 4/17 |
| 2° 7′ 4″ | ditto | 8/34 |
| 2° 7′ 54″ | 2.1316° | 9/38 |
| 2° 8′ 34″ | 2.1429° | 5/21 |
| 2° 8′ 34″ | ditto | 10/42 |
| 2° 9′ 8″ | 2.1522° | 11/46 |
| 2° 10′ 00″ | 2.1666° | 13/54 |
| 2° 10′ 21″ | 2.1724° | 7/29 |
| 2° 10′ 21″ | ditto | 14/58 |
| 2° 10′ 39″ | 2.1774° | 15/62 |
| 2° 10′ 54″ | 2.1818° | 8/33 |
| 2° 10′ 54″ | ditto | 16/66 |
| 2° 11′ 21″ | 2.1892° | 9/37 |
| 2° 11′ 42″ | 2.1951° | 10/41 |
| 2° 12′ 15″ | 2.2041° | 12/49 |
| 2° 15′ 00″ | 2.2500° | 4/16 |
| 2° 15′ 00″ | ditto | 5/20 |
| 2° 15′ 00″ | ditto | 6/24 |
| 2° 15′ 00″ | ditto | 7/28 |
| 2° 17′ 52″ | 2.2979° | 12/47 |
| 2° 18′ 8″ | 2.3023° | 11/43 |
| 2° 18′ 28″ | 2.3077° | 10/39 |
| 2° 19′ 5″ | 2.3182° | 17/66 |
| 2° 19′ 21″ | 2.3226° | 8/31 |
| 2° 19′ 21″ | ditto | 16/62 |
| 2° 19′ 39″ | 2.3276° | 15/58 |
| 2° 20′ 00″ | 2.3333° | 7/27 |
| 2° 20′ 00″ | ditto | 14/54 |
| 2° 20′ 52″ | 2.3478° | 6/23 |
| 2° 20′ 52″ | ditto | 12/46 |
| 2° 21′ 26″ | 2.3571° | 11/42 |
| 2° 22′ 6″ | 2.3684° | 5/19 |
| 2° 22′ 6″ | ditto | 10/38 |
| 2° 22′ 56″ | 2.3824° | 9/34 |
| 2° 23′ 16″ | 2.3878° | 13/49 |
| 2° 24′ 00″ | 2.4000° | 4/15 |
| 2° 24′ 00″ | ditto | 8/30 |
| 2° 24′ 53″ | 2.4146° | 11/41 |
| 2° 25′ 57″ | 2.4324° | 10/37 |
| 2° 27′ 16″ | 2.4545° | 9/33 |
| 2° 27′ 16″ | ditto | 18/66 |
| 2° 28′ 4″ | 2.4677° | 17/62 |
| 2° 28′ 58″ | 2.4828° | 8/29 |
| 2° 28′ 58″ | ditto | 16/58 |
| 2° 29′ 22″ | 2.4894° | 13/47 |
| 2° 30′ 00″ | 2.5000° | 5/18 |
| 2° 30′ 00″ | ditto | 15/54 |
| 2° 30′ 42″ | 2.5116° | 12/43 |
| 2° 32′ 18″ | 2.5385° | 11/39 |
| 2° 32′ 36″ | 2.5435° | 13/46 |
| 2° 34′ 17″ | 2.5714° | 6/21 |
| 2° 34′ 17″ | ditto | 8/28 |
| 2° 34′ 17″ | ditto | 12/42 |
| 2° 34′ 17″ | ditto | 14/49 |
| 2° 35′ 27″ | 2.5909° | 19/66 |
| 2° 36′ 19″ | 2.6053° | 11/38 |
| 2° 36′ 46″ | 2.6129° | 9/31 |
| 2° 36′ 46″ | ditto | 18/62 |
| 2° 37′ 30″ | 2.6250° | 7/24 |
| 2° 38′ 3″ | 2.6341° | 12/41 |
| 2° 38′ 17″ | 2.6379° | 17/58 |
| 2° 38′ 49″ | 2.6471° | 5/17 |
| 2° 38′ 49″ | ditto | 10/34 |
| 2° 40′ 00″ | 2.6666° | 8/27 |
| 2° 40′ 00″ | ditto | 16/54 |
| 2° 40′ 32″ | 2.6757° | 11/37 |
| 2° 40′ 51″ | 2.6809° | 14/47 |
| 2° 42′ 00″ | 2.7000° | 6/20 |
| 2° 42′ 00″ | ditto | 9/30 |
| 2° 43′ 15″ | 2.7209° | 13/43 |
| 2° 43′ 38″ | 2.7272° | 10/33 |
| 2° 43′ 38″ | ditto | 20/66 |
| 2° 44′ 21″ | 2.7391° | 7/23 |
| 2° 44′ 21″ | ditto | 14/46 |
| 2° 45′ 18″ | 2.7551° | 15/49 |
| 2° 45′ 29″ | 2.7581° | 19/62 |
| 2° 46′ 9″ | 2.7692° | 12/39 |
| 2° 47′ 9″ | 2.7857° | 13/42 |
| 2° 47′ 35″ | 2.7931° | 9/29 |
| 2° 47′ 35″ | ditto | 18/58 |
| 2° 48′ 45″ | 2.8125° | 5/16 |
| 2° 50′ 00″ | 2.8333° | 17/54 |
| 2° 50′ 32″ | 2.8421° | 6/19 |
| 2° 50′ 32″ | ditto | 12/38 |
| 2° 51′ 13″ | 2.8537° | 13/41 |
| 2° 51′ 49″ | 2.8636° | 21/66 |
| 2° 52′ 20″ | 2.8723° | 15/47 |
| 2° 53′ 34″ | 2.8929° | 9/28 |
| 2° 54′ 12″ | 2.9032° | 10/31 |
| 2° 54′ 12″ | ditto | 20/62 |
| 2° 54′ 42″ | 2.9118° | 11/34 |
| 2° 55′ 8″ | 2.9189° | 12/37 |
| 2° 55′ 49″ | 2.9302° | 14/43 |
| 2° 56′ 5″ | 2.9348° | 15/46 |
| 2° 56′ 20″ | 2.9388° | 16/49 |
| 2° 56′ 54″ | 2.9483° | 19/58 |
| 3° 00′ 00″ | 3.0000° | 5/15 |
| 3° 00′ 00″ | ditto | 6/18 |
| 3° 00′ 00″ | ditto | 7/21 |
| 3° 00′ 00″ | ditto | 8/24 |
| 3° 00′ 00″ | ditto | 9/27 |
| 3° 00′ 00″ | ditto | 10/30 |
| 3° 00′ 00″ | ditto | 11/33 |
| 3° 00′ 00″ | ditto | 13/39 |
| 3° 00′ 00″ | ditto | 14/42 |
| 3° 00′ 00″ | 3.0000° | 18/54 |
| 3° 00′ 00″ | ditto | 22/66 |
| 3° 2′ 54″ | 3.0484° | 21/62 |




# CHASER LIFE INCREASED 50%

## Sun Cutting Oil Improves Quality of Threads, Steps-up Pipe Nipple Production

**Operation:** Threading 4" pipe nipples

**Machine:** Landis Threading Machine

**Material:** 4" galvanized welded steel tubing SAE 1025-1040

**Speed:** Threading 1½" on each end of about 300 pieces per 8-hr. day

**Chaser Life:** 3 days before resharpening

**Cutting Fluid:** Sun Cutting Oil 31W

A manufacturer threading pipe nipples was not getting satisfactory finished threads with the cutting fluid in use. Chaser life was abnormally short, resulting in excessive downtime and high percentage of rejects, with consequent loss of production.

Changing to Sun Cutting Oil 31W, this shop increased chaser life 50 percent, and reports that "the threads are the best we ever made." With rejects practically eliminated and downtime for changing chasers reduced to the absolute minimum, production has greatly increased.

Sun Cutting Oil 31W is a dark, free-flowing, sulphurized oil. It is recommended for heavy duty jobs where an emulsified cutting oil is not suitable. For further information about Sun Cutting Oils or other "Job Proved" Products for the metalworking industry, call or write the nearest Sun Office. The services of a Sun Engineer are available without obligation.

**SUN OIL COMPANY · *Philadelphia 3, Pa.***

*In Canada:* Sun Oil Company, Ltd.
Toronto and Montreal

**SUN PETROLEUM PRODUCTS**

**"JOB PROVED" IN EVERY INDUSTRY**

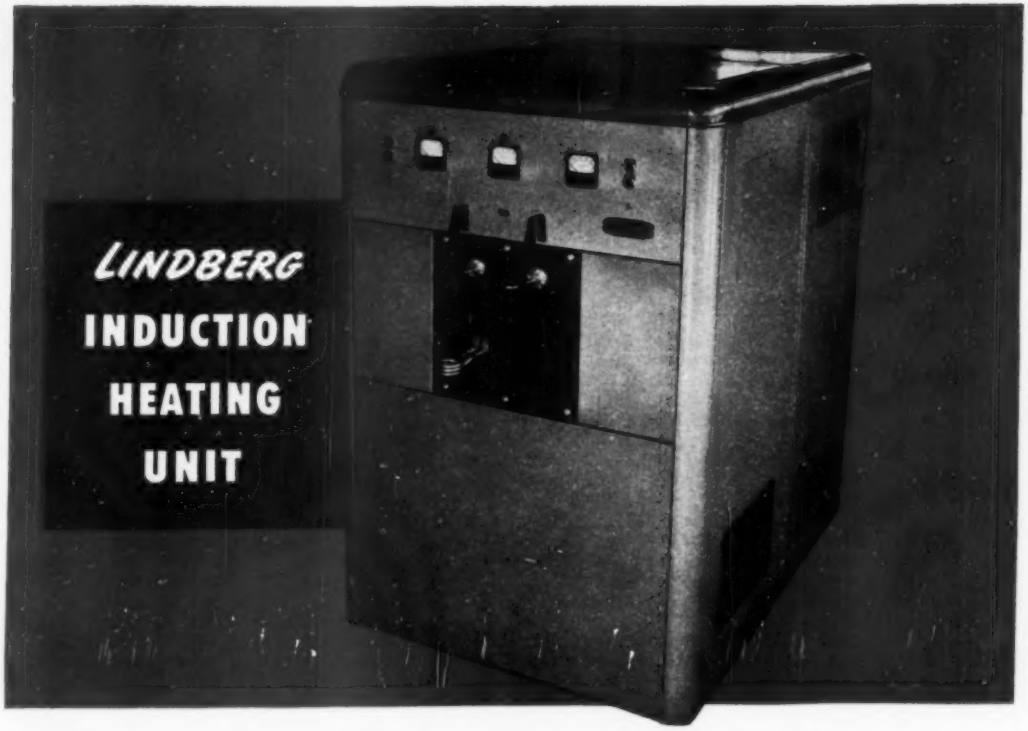
SUNOCO

American Machinist

# Simple Indexing...III

| Angle | Decimal Equiv. | Hole and Plate |
|---|---|---|
| 3° 3′ 50″ | 3.0638° | 16/47 |
| 3° 4′ 23″ | 3.0732° | 14/41 |
| 3° 4′ 44″ | 3.0789° | 13/38 |
| 3° 6′ 12″ | 3.1034° | 10/29 |
| 3° 6′ 12″ | ditto | 20/58 |
| 3° 7′ 21″ | 3.1224° | 17/49 |
| 3° 7′ 50″ | 3.1304° | 8/23 |
| 3° 7′ 50″ | ditto | 16/46 |
| 3° 8′ 11″ | 3.1364° | 23/66 |
| 3° 8′ 22″ | 3.1395° | 15/43 |
| 3° 9′ 00″ | 3.1500° | 7/20 |
| 3° 9′ 44″ | 3.1622° | 13/37 |
| 3° 10′ 00″ | 3.1666° | 19/54 |
| 3° 10′ 35″ | 3.1765° | 6/17 |
| 3° 10′ 35″ | ditto | 12/34 |
| 3° 11′ 37″ | 3.1935° | 11/31 |
| 3° 11′ 37″ | ditto | 22/62 |
| 3° 12′ 51″ | 3.2143° | 10/28 |
| 3° 12′ 51″ | ditto | 15/42 |
| 3° 13′ 51″ | 3.2308° | 14/39 |
| 3° 15′ 19″ | 3.2553° | 17/47 |
| 3° 15′ 31″ | 3.2586° | 21/58 |
| 3° 16′ 22″ | 3.2727° | 12/33 |
| 3° 16′ 22″ | ditto | 24/66 |
| 3° 17′ 34″ | 3.2927° | 15/41 |
| 3° 18′ 00″ | 3.3000° | 11/30 |
| 3° 18′ 22″ | 3.3061° | 18/49 |
| 3° 18′ 57″ | 3.3158° | 7/19 |
| 3° 18′ 57″ | ditto | 14/38 |
| 3° 19′ 34″ | 3.3261° | 17/46 |
| 3° 20′ 00″ | 3.3333° | 10/27 |
| 3° 20′ 00″ | ditto | 20/54 |
| 3° 20′ 19″ | 3.3387° | 23/62 |
| 3° 20′ 56″ | 3.3488° | 16/43 |
| 3° 22′ 30″ | 3.3750° | 6/16 |
| 3° 22′ 30″ | ditto | 9/24 |
| 3° 24′ 19″ | 3.4054° | 14/37 |
| 3° 24′ 33″ | 3.4091° | 25/66 |
| 3° 24′ 50″ | 3.4138° | 11/29 |
| 3° 24′ 50″ | ditto | 22/58 |
| 3° 25′ 43″ | 3.4286° | 8/21 |
| 3° 25′ 43″ | ditto | 16/42 |
| 3° 26′ 28″ | 3.4412° | 13/34 |
| 3° 26′ 49″ | 3.4468° | 18/47 |
| 3° 27′ 42″ | 3.4615° | 15/39 |
| 3° 29′ 2″ | 3.4839° | 12/31 |
| 3° 29′ 2″ | ditto | 24/62 |
| 3° 29′ 23″ | 3.4898° | 19/49 |
| 3° 30′ 00″ | 3.5000° | 7/18 |
| 3° 30′ 00″ | ditto | 21/54 |
| 3° 30′ 44″ | 3.5122° | 16/41 |
| 3° 31′ 18″ | 3.5217° | 9/23 |
| 3° 31′ 18″ | ditto | 18/46 |
| 3° 32′ 9″ | 3.5357° | 11/28 |
| 3° 32′ 44″ | 3.5454° | 13/33 |
| 3° 32′ 44″ | ditto | 26/66 |
| 3° 33′ 9″ | 3.5526° | 15/38 |
| 3° 33′ 29″ | 3.5581° | 17/43 |
| 3° 34′ 8″ | 3.5690° | 23/58 |
| 3° 36′ 00″ | 3.6000° | 6/15 |
| 3° 36′ 00″ | ditto | 8/20 |
| 3° 36′ 00″ | ditto | 12/30 |
| 3° 37′ 45″ | 3.6290° | 25/62 |
| 3° 38′ 18″ | 3.6383° | 19/47 |
| 3° 38′ 34″ | 3.6429° | 17/42 |
| 3° 38′ 55″ | 3.6486° | 15/37 |
| 3° 40′ 00″ | 3.6666° | 11/27 |
| 3° 40′ 00″ | ditto | 22/54 |
| 3° 40′ 24″ | 3.6735° | 20/49 |
| 3° 40′ 54″ | 3.6818° | 27/66 |
| 3° 41′ 32″ | 3.6923° | 16/39 |
| 3° 42′ 21″ | 3.7059° | 7/17 |
| 3° 42′ 21″ | 3.7059° | 14/34 |
| 3° 43′ 3″ | 3.7174° | 19/46 |
| 3° 43′ 27″ | 3.7241° | 12/29 |
| 3° 43′ 27″ | ditto | 24/58 |
| 3° 43′ 54″ | 3.7317° | 17/41 |
| 3° 45′ 00″ | 3.7500° | 10/24 |
| 3° 46′ 3″ | 3.7674 | 18/43 |
| 3° 46′ 27″ | 3.7742° | 13/31 |
| 3° 46′ 27″ | ditto | 26/62 |
| 3° 47′ 22″ | 3.7895° | 8/19 |
| 3° 47′ 22″ | ditto | 16/38 |
| 3° 49′ 5″ | 3.8182° | 14/33 |
| 3° 49′ 5″ | ditto | 28/66 |
| 3° 49′ 47″ | 3.8298° | 20/47 |
| 3° 50′ 00″ | 3.8333° | 23/54 |
| 3° 51′ 26″ | 3.8571° | 9/21 |
| 3° 51′ 26″ | ditto | 12/28 |
| 3° 51′ 26″ | ditto | 18/42 |
| 3° 51′ 26″ | ditto | 21/49 |
| 3° 52′ 46″ | 3.8793° | 25/58 |
| 3° 53′ 31″ | 3.8919° | 16/37 |
| 3° 54′ 00″ | 3.9000° | 13/30 |
| 3° 54′ 47″ | 3.9130° | 10/23 |
| 3° 54′ 47″ | ditto | 20/46 |
| 3° 55′ 10″ | 3.9194° | 27/62 |
| 3° 55′ 23″ | 3.9231° | 17/39 |
| 3° 56′ 15″ | 3.9375° | 7/16 |
| 3° 57′ 4″ | 3.9512° | 18/41 |
| 3° 57′ 16″ | 3.9545° | 29/66 |
| 3° 58′ 14″ | 3.9706° | 15/34 |
| 3° 58′ 36″ | 3.9767° | 19/43 |
| 4° 00′ 00″ | 4.0000° | 8/18 |
| 4° 00′ 00″ | ditto | 12/27 |
| 4° 00′ 00″ | ditto | 24/54 |
| 4° 1′ 17″ | 4.0213° | 21/47 |
| 4° 1′ 35″ | 4.0263° | 17/38 |
| 4° 2′ 4″ | 4.0345° | 13/29 |
| 4° 2′ 4″ | ditto | 26/58 |
| 4° 2′ 27″ | 4.0408° | 22/49 |
| 4° 3′ 00″ | 4.0500° | 9/20 |
| 4° 3′ 52″ | 4.0645° | 14/31 |
| 4° 3′ 52″ | ditto | 28/62 |
| 4° 4′ 17″ | 4.0714° | 19/42 |
| 4° 5′ 27″ | 4.0909° | 15/33 |
| 4° 5′ 27″ | ditto | 30/66 |
| 4° 6′ 31″ | 4.1087° | 21/46 |
| 4° 7′ 30″ | 4.1250° | 11/24 |
| 4° 8′ 6″ | 4.1351° | 17/37 |
| 4° 9′ 14″ | 4.1538° | 18/39 |
| 4° 10′ 00″ | 4.1666° | 25/54 |
| 4° 10′ 15″ | 4.1707° | 19/41 |
| 4° 10′ 43″ | 4.1786° | 13/28 |
| 4° 11′ 10″ | 4.1860° | 20/43 |
| 4° 11′ 23″ | 4.1897° | 27/58 |
| 4° 12′ 00″ | 4.2000° | 7/15 |
| 4° 12′ 00″ | ditto | 14/30 |
| 4° 12′ 35″ | 4.2097° | 29/62 |
| 4° 12′ 46″ | 4.2128° | 22/47 |
| 4° 13′ 28″ | 4.2245° | 23/49 |
| 4° 13′ 38″ | 4.2272° | 31/66 |
| 4° 14′ 7″ | 4.2353° | 8/17 |
| 4° 14′ 7″ | ditto | 16/34 |
| 4° 15′ 47″ | 4.2632° | 9/19 |
| 4° 15′ 47″ | ditto | 18/38 |
| 4° 17′ 9″ | 4.2857° | 10/21 |
| 4° 17′ 9″ | ditto | 20/42 |
| 4° 18′ 16″ | 4.3043° | 11/23 |
| 4° 18′ 16″ | ditto | 22/46 |
| 4° 20′ 00″ | 4.3333° | 13/27 |
| 4° 20′ 00″ | ditto | 26/54 |
| 4° 20′ 41″ | 4.3448° | 14/29 |
| 4° 20′ 41″ | ditto | 28/58 |
| 4° 21′ 17″ | 4.3548° | 15/31 |
| 4° 21′ 17″ | ditto | 30/62 |
| 4° 21′ 49″ | 4.3636° | 16/33 |
| 4° 21′ 49″ | 4.3636° | 32/66 |
| 4° 22′ 42″ | 4.3784° | 18/37 |
| 4° 23′ 5″ | 4.3846° | 19/39 |
| 4° 23′ 25″ | 4.3902° | 20/41 |
| 4° 23′ 43″ | 4.3953° | 21/43 |
| 4° 24′ 15″ | 4.4043° | 23/47 |
| 4° 24′ 29″ | 4.4082° | 24/49 |
| 4° 30′ 00″ | 4.5000° | 8/16 |
| 4° 30′ 00″ | ditto | 9/18 |
| 4° 30′ 00″ | ditto | 10/20 |
| 4° 30′ 00″ | ditto | 12/24 |
| 4° 30′ 00″ | ditto | 14/28 |
| 4° 30′ 00″ | ditto | 15/30 |
| 4° 30′ 00″ | ditto | 17/34 |
| 4° 30′ 00″ | ditto | 19/38 |
| 4° 30′ 00″ | ditto | 21/42 |
| 4° 30′ 00″ | ditto | 23/46 |
| 4° 30′ 00″ | ditto | 27/54 |
| 4° 30′ 00″ | ditto | 29/58 |
| 4° 30′ 00″ | ditto | 31/62 |
| 4° 30′ 00″ | ditto | 33/66 |
| 4° 35′ 31″ | 4.5918° | 25/49 |
| 4° 35′ 45″ | 4.5957° | 24/47 |
| 4° 36′ 17″ | 4.6047° | 22/43 |
| 4° 36′ 35″ | 4.6098° | 21/41 |
| 4° 36′ 55″ | 4.6154° | 20/39 |
| 4° 37′ 18″ | 4.6216° | 19/37 |
| 4° 38′ 11″ | 4.6364° | 17/33 |
| 4° 38′ 11″ | ditto | 34/66 |
| 4° 38′ 43″ | 4.6452° | 16/31 |
| 4° 38′ 43″ | ditto | 32/62 |
| 4° 39′ 19″ | 4.6552° | 15/29 |
| 4° 39′ 19″ | ditto | 30/58 |
| 4° 40′ 00″ | 4.6666° | 14/27 |
| 4° 40′ 00″ | ditto | 28/54 |
| 4° 41′ 44″ | 4.6957° | 12/23 |
| 4° 41′ 44″ | ditto | 24/46 |
| 4° 42′ 51″ | 4.7143° | 11/21 |
| 4° 42′ 51″ | ditto | 22/42 |
| 4° 44′ 13″ | 4.7368° | 10/19 |
| 4° 44′ 13″ | ditto | 20/38 |
| 4° 45′ 53″ | 4.7647° | 9/17 |
| 4° 45′ 53″ | ditto | 18/34 |
| 4° 46′ 22″ | 2.7727° | 35/66 |
| 4° 46′ 32″ | 4.7755° | 26/49 |
| 4° 47′ 14″ | 4.7872° | 25/47 |
| 4° 47′ 25″ | 4.7903° | 33/62 |
| 4° 48′ 00″ | 4.8000° | 8/15 |
| 4° 48′ 00″ | ditto | 16/30 |
| 4° 48′ 37″ | 4.8103° | 31/58 |
| 4° 48′ 50″ | 4.8140° | 23/43 |
| 4° 49′ 17″ | 4.8214° | 15/28 |
| 4° 49′ 45″ | 4.8293° | 22/41 |
| 4° 50′ 00″ | 4.8333° | 29/54 |
| 4° 50′ 46″ | 4.8462° | 21/39 |
| 4° 51′ 54″ | 4.8649° | 20/37 |
| 4° 52′ 30″ | 4.8750° | 13/24 |
| 4° 53′ 29″ | 4.8913° | 25/46 |
| 4° 54′ 33″ | 4.9091° | 18/33 |
| 4° 54′ 33″ | ditto | 36/66 |
| 4° 55′ 43″ | 4.9286° | 23/42 |
| 4° 56′ 8″ | 4.9355° | 17/31 |
| 4° 56′ 8″ | ditto | 34/62 |
| 4° 57′ 00″ | 4.9500° | 11/20 |
| 4° 57′ 33″ | 4.9592° | 27/49 |
| 4° 57′ 56″ | 4.9655° | 16/29 |
| 4° 57′ 56″ | ditto | 32/58 |
| 4° 58′ 25″ | 4.9737° | 21/38 |
| 4° 58′ 43″ | 4.9787° | 26/47 |

(To be continued)




# NEW and EXCLUSIVE developments in induction heating...

Available in single and two-station models the Lindberg LI-25 is ideal for hardening, brazing and soldering, annealing and stress relieving, hot forming and light forging, shrink fitting and other induction heating applications.

The Lindberg LI-25 is a ruggedly constructed vacuum-tube type unit for hard working production line jobs. Oscillator tube, power transformer and other major components deliver a full 25 KW with plenty of reserve to insure dependable day in and day out performance. Well designed—safe and simple to operate—featuring the most desirable developments in high frequency heating.

**CONDITIONED COOLING**—Built-in to increase tube life, eliminate harmful condensation and scaling, reduce water pressure and consumption—can be used with hard water. Rubber hoses are completely eliminated.

**"CHECKLITE"**—a unique feature exclusive with this unit, makes servicing easier, reduces maintenance costs.

**AUTOMATIC CONTROL**—when job cycles are set, automatic timer controls every phase of the operation—heat, quench, fixture movement.

**SAFE AND SIMPLE**—both operator and operating parts are protected—filament voltages are constantly regulated—tank capacitor is hermetically sealed—work coils protected against burn out. Every unit certified to meet FCC regulations. For detailed information write for Bulletin T-1420.

**For specific application information contact your local Lindberg Office, or write describing your problem in detail.**

## LINDBERG HIGH FREQUENCY HEATING

**A DIVISION OF LINDBERG ENGINEERING CO.**
**2445 West Hubbard Street, Chicago 12, Illinois**

# TALKING SHOP

### No Body Heat

SCALES for precision astronomical and metalworking equipment are generated under most exacting and unusual conditions. David Mann, for example, has his generating machine in a room several feet under the basement floor so it can be closed off for the entire generating period —which may be as much as a week. Temperature is maintained by a small gas flame with minor fluctuations handled by a light bulb. At the Société Genevoise plant in Switzerland, lateral and cross-setting scales for the jig borer are generated in a concrete room three stories below the ground, and maintained at a constant 68 F. The operator sets the work under the diamond scriber, and sets a timer so the machine does not begin scribing until 18 hours after he has left. This permits absolute stabilization of the temperature following the rise created by the presence of the operator. The operator does not return until 8 hours after cutting is completed, then his first check is of a seismograph besides the cutting machine to see if any earth tremors have affected scribing of the scale.

### Red Machine Tools

THE WELL-KNOWN Soviet penchant for claiming credit for everything, as well as the careful control of the satellite nations, is typified by an article which appeared recently in the technical section of the daily newspaper of the trade unions in Prague, Czechoslovakia. It describes Soviet machine tools at the Fiftieth Prague Trade Fair. It concludes with a statement: "A very oft-repeated assertion that the Soviet construction of machine tools is not only perfect, but even in advance of world standard, is again confirmed here; and if this fact is not quite appreciated in some places, it is only due to lack of knowledge."

Just previously, the article describes a Soviet toolroom lathe, Dip-200, built by Krasny Proletariet Works, as having 12 to 600 rpm and a 5-hp motor. This is supposedly an example of most modern construction. Current American equivalent machines have speeds up to 4000 rpm and 25 or 50 hp. Perhaps our Soviet friends should re-examine the world standard they speak about, because the "lack of knowledge" may not be where they suggest it is.

### Cocoons

ACHILLES's mother is supposed to have held him by one heel while he was dipped in the River Styx. The same principle is followed by one maker of precision steel parts, who has Alnico magnets mounted on the conveyor chain so the parts can be dipped in a hot plastic bath. To remove the "Achilles's heel" left by the magnet, the exposed end is later hand dipped. . . . Surface plates are among the latest tools to be protected by an air-drying plastic covering during shipment and warehousing. . . . Combination of this sealing plastic with cheesecloth taped over units to be protected has now been released by the government. It was used extensively to seal guns, machinery, etc., in "cocoons."

### Shock Plate

CHROMIUM is notoriously hard to "throw" into masked or remote areas in plating complex parts. Udylite discovered a while back that an initial "flash" plate — high current intensity for a very short time — will start the plating and that coverage thereafter at normal plating current is much improved. If the heavy current is on for only 4 or 5 seconds, no frosting occurs. The latest Udylite machine therefore incorporates a special busbar section through which one hanger at a time can be given the momentary high-current coat. Separate power leads feed this section. The machine uses tracks and pushers, not conveyor chain, so hanger spacing can be varied as desired.

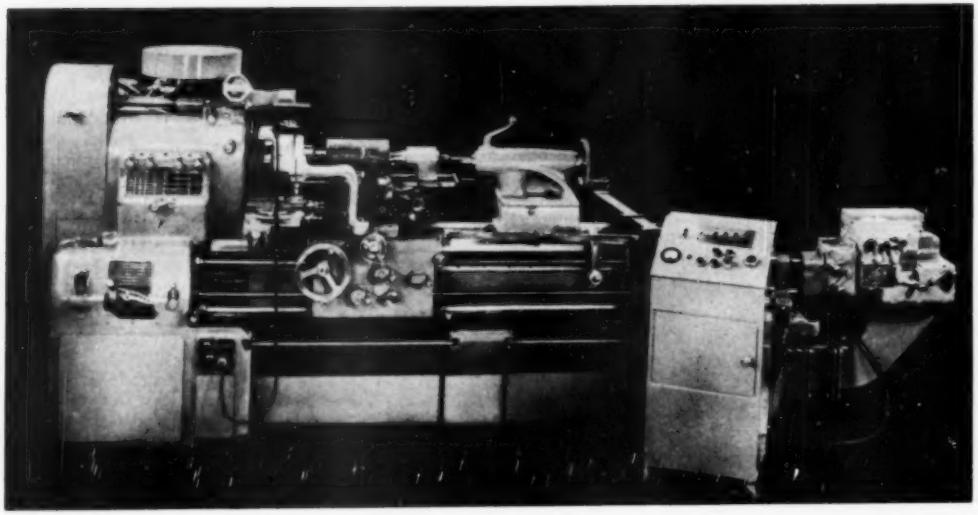
### Daffynitions

PRETZEL MANUFACTURER: man who makes crooked dough . . . GENTLEMAN: one who doesn't blow his knows in public . . . BIG FOUR DECISION: to each his zone . . . MODERN HOME: where there's a switch to regulate everything but the children . . . EARLY SETTLER: one who pays his bills promptly . . . SPINNING WHEELS: something a lady sits with—until some man comes along to put on her tire chains . . . DIAMOND CUTTER: ball-park grounds keeper . . . ROAD MARKERS: highwayglyphics . . . YES-MAN: one who stoops to concur . . . NATATORIUM: old swimming hole with a lifeguard . . . GOOD MANNERS: to be able to put up with bad ones . . . MONEY: what you could get along without if other people weren't so crazy about it.

### Mudguard

ONE TRACTOR COMPANY reportedly uses drive gears with 0.090-in. case hardening on the teeth to resist wear from mud. It would seem easier to guard the drive gear and use a thinner case, then any mud that got in could be taken care of by providing a little greater root clearance. In agricultural machinery generally, it is usually advisable to cut parts to a minimum because of the unbelievable mistreatment the equipment gets in service.

# New Shop Equipment



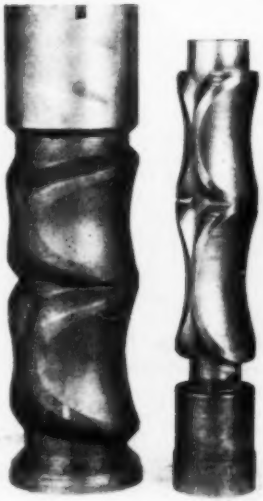
## Monarch Engraver Cuts Repeating Patterns

The Shapemaster Engraver is essentially a lathe. By removing the special-carriage cross-slide and substituting a conventional cross-slide and toolpost, the unit becomes a versatile engine lathe with a 26½-in. swing over the bed and 48 in. between centers. Four basic elements of the engraving unit are a master record, change gearing, stroke-adjusting mechanism, and a linkage arrangement. The master record dictates the form to be reproduced and the gearing regulates the number of times the form is repeated on the work circumference. Shaper-like tool motion is transferred to the tool carrier from the master record through the pantograph stroke mechanism. The linkage arrangement controls the relation between the length of the pattern on the record and on the work.

Change gears can be set to repeat the master pattern from one to 520 times around the work circumferences. Maximum tool travel must not exceed 2½ in. The Shapemaster cuts externally, internally, or on a face. The master record must be at least as large as the largest mold required, as the machine is capable of reproducing up to the pattern size only. However, scale reductions can be made in any combination of length, width and engraved depth.

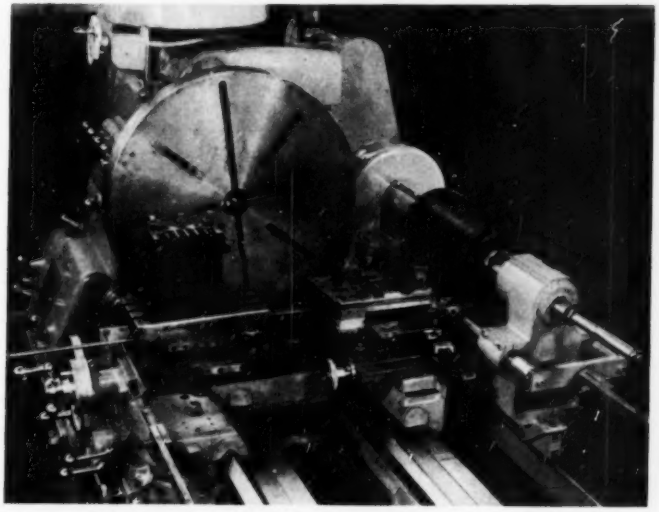
Master records can be made on the machine. A pattern model (usually hand-made) is mounted in the lathe chuck and the sharp pointed follower is substituted for the turning tool. As the chuck is slowly rotated the follower, in contact with the model, transmits the design through the stroking mechanism to the slide which normally carries the master record tracer point. This point is replaced by a small, individually motor-driven cutter which reproduces the pattern in the master record blank.

For production of certain patterns and shapes the master record can be made as a flat disk cam, of such shape to generate one pattern cycle. End gearing can be set up to rotate the cam as many times as desired up to 520 times for each revolution of the work. Master cams can be produced in the same manner as master



**Which is which? The pattern is on the right and the master record it was made from is on the left**

# Materials and Parts

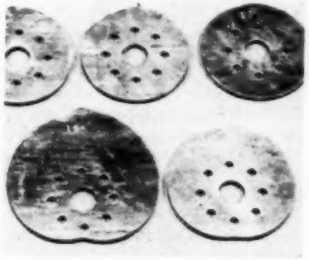


Close-up shows master record (to right) and linkage between roller follower and toolslide. When special cross-slide is replaced by conventional cross-slide and toolpost, unit becomes versatile engine lathe

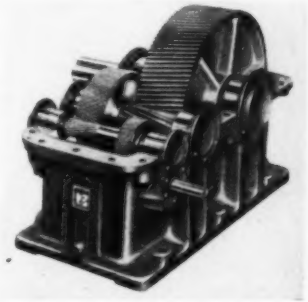
records. Cams may also be used as patterns in cutting records.

The Shapemaster engraver can produce a design on a part where the mean diameter changes with the length. Records indicate that molds have been produced in as little as 1/100 of the time required by former methods.

*The Monarch Machine Tool Co., Sidney, Ohio*



Flat disk cams can be used for master records, revolving up to 520 times per revolution of the work to produce that many repeating pattern cycles on the work



## Inclosed Helical-Gear Drives Range to 1500-HP Capacity

Maxi-Power drives are available in 42 sizes with standard ratios ranging from 2.08:1 up to 360:1. Capacities range up to 1550 hp. Features of this speed-reducer line include improved accuracy of gear-tooth generation, closer manufacturing tolerances and reinforced housing design. Other improvements are said to permit selection of smaller-size lower-weight unit than was previously possible.

*Foote Bros. Gear and Machine Corp., 4545 South Western Blvd., Chicago 9, Ill.*

## ...INCLUDING


**High-pressure** hydraulic die-casting machine, is adaptable for either cold-chamber aluminum casting or goose-neck operation for zinc, tin, or lead.....page 136

**Overhead threading attachment** for lathes speeds single-point chasing operations on non-ferrous metals .....page 137

**Hydraulic corner drawing press** eliminates the need for hand welding and metal finishing operations. One set of dies can handle a wide range of corner radii or panel sizes.....page 138

**Underfeed clincher** eliminates transfer ram during nut-setting operations. Machine is fully automatic and is controlled by a single foot pedal .....page 140

**Layout drilling machine** facilitates greater accuracy than is possible with an ordinary drilling machine. Saddle and table movement are controlled by leadscrews accurate to within 0.0001 in.....page 144

**Machine,** equipped with special full-receding pipe taps, is said to greatly reduce operating time in boring, reaming, threading, and counterboring cast iron pipe flanges.....page 148

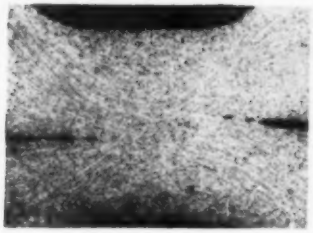
**Full-universal drilling machine** can perform radial, horizontal, or angular drilling, tapping, boring, spotfacing or reaming operations on a full production basis.....page 150


## ...and in Dec. 15

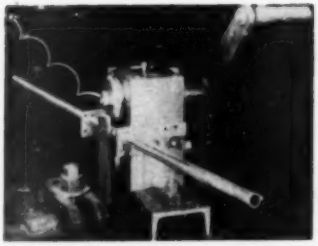

**Heavy-duty lathe** with quadrant gearing and a 60-feed gear box can be quickly changed from standard operations to metric-, module-, and diametral-pitch setups.

**Large-area shaper,** employing the boring-mill travel method, can shape a surface requiring up to 8-ft table travel without resetting of workpiece.

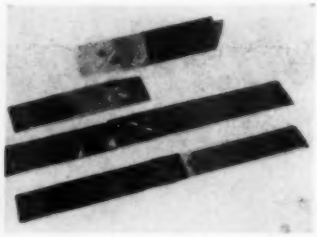
**Horizontal milling machine** is equipped with a built-in rotary table which provides cross feed and power rapid traverse on its saddle. Table top furnishes a working surface 44 in. in dia.



Micro-section of typical Koldweld cold pressure weld shows lines of flow and absence of weld line



Continuous seam welding machine automatically brushes, final forms, welds, and trims during tube making



Lower strip joint is aluminum to copper and center joint is aluminum to aluminum. Top pieces show tear

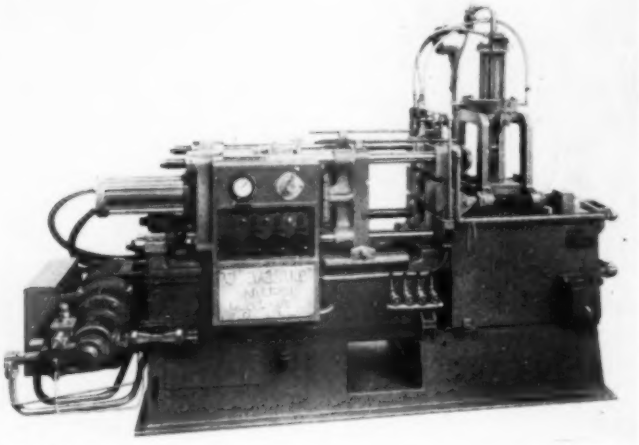
# Metals Joined by Cold Pressure Welding

The Koldwelding metal joining process, developed by General Electric Co. Ltd., England, has been successfully applied to aluminum and its alloys, cadmium, lead, copper, zinc, and silver. Experimental work on ferrous metals is not yet completed. Metal being cold welded must be thoroughly wire brushed and protected from film of oxide until the weld is completed. Once removed, the oxide film re-forms comparatively slowly, and satisfactory welds can be made several hours later if the cleaned surface has not been contaminated by moisture or grease. However, even the contamination caused by handling will prevent a satisfactory weld.

In the cold pressure process the rate of application of the pressure does not appear to affect the strength of the weld. However, the shape of the tool is said to be most important. Straight, ring, and continuous-seam welds have been effected by the cold weld process.

Straight welds can be used for box seams, sealing tube ends, and other forms of lapped joints which are similar to butt-welds. The primary use of ring welds is for sealing the ends of flanged tubes, and the seam welds are for tube making.

*Koldweld Corporation, Suite 4408, 10 East 40th St., New York 16, N. Y.*



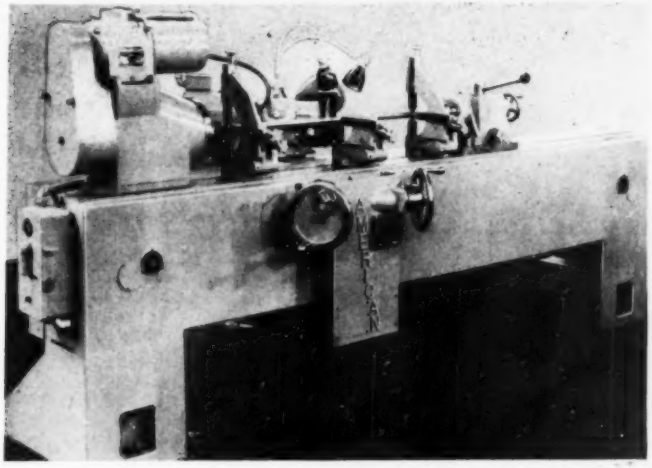
# Cleveland Die Caster Adaptable for Aluminum, Zinc, Tin or Lead

Model 50 is a high-pressure hydraulic unit which can be furnished either as a cold-chamber machine for casting aluminum or as a goose-neck type for casting zinc, tin or lead. The press is equipped with a Vikers two-stage pump driven by a 10-hp dc motor. The pump delivers 43 gpm at the low-pressure stage and 2½ gpm at the high-pressure (500 psi) stage.

Model 50 has die plates which are 22x18 in. and four tie bars which are 2 in. in diameter. Space between tie bars is 16x12 in. and the die opening is 8 in. An estimated 50-ton locking pressure is obtained through a toggle mechanism. The machine can produce aluminum castings up to 2½ lb, and zinc castings up to 4 lb. The free-cycle time of the machine is well over 1000 shots per hour. However, actual production rate of any casting is dependent upon the complexity and size of the casting itself. Model 50 can be supplied with either manual or automatic controls. Automatic units can be run manually for setup purposes.

*The Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.*

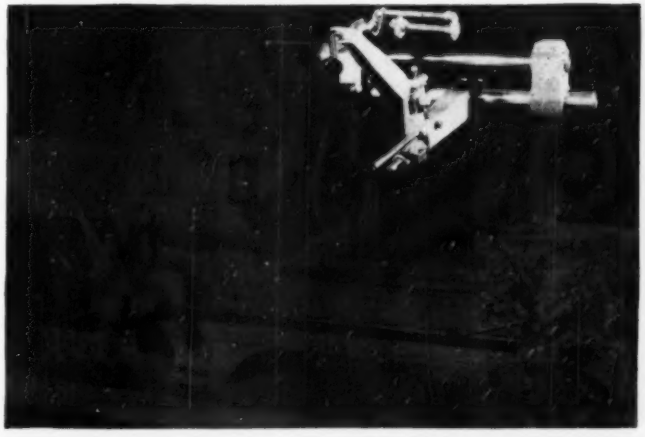
## Broach-Sharpener Spindle Mounted on Traversing Carriage

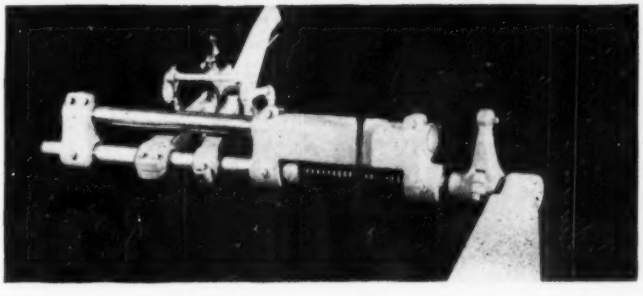


Work is mounted between centers on the stationary bed on Model RBS cylindrical-broach resharpening machines and the grinding-wheel spindle is mounted on a traversing carriage. The machine is for resharpening internal broaches. Micrometer dial wheels control the lateral traverse of a carriage and infeed of the grinding spindle and variable-speed drive is afforded for rotation of the broach. The unit is equipped with anti-friction bearing rollers and hardened and ground carriage mounting rails. The RBS-9-84 model handles round broaches up to 9-in. dia and 84-in. length, and the RBS-9-60, 9-in. dia. round broaches, to 60-in. length.

*American Broach and Machine Co., Ann Arbor, Mich.*

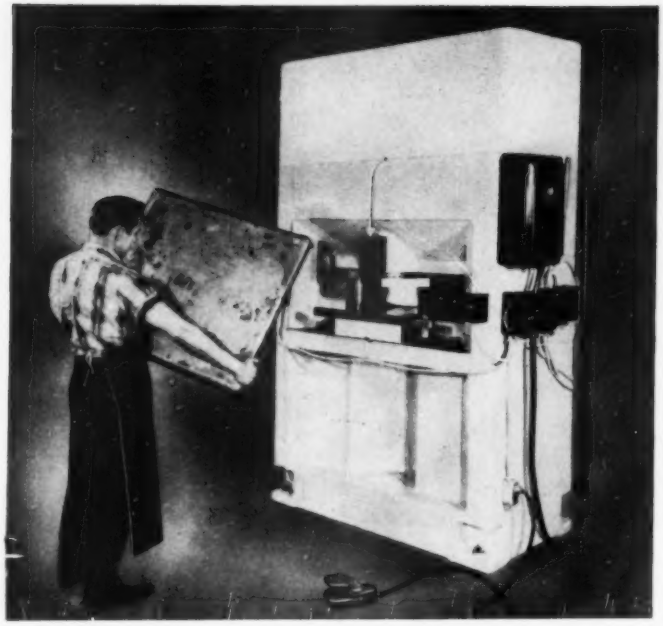
## Overhead Threading Attachment Added to Turret Lathe





Mounted at the rear of the turret-lathe headstock, overhead threading attachment is said to speed single-point chasing operations in nonferrous metals. A screw-adjustable slide-tool holder extends to the right of the spindle and a fixed overhead bar supports counterweighted chasing bar on which a guide arm and the chasing-tool arm are located. When the chasing-tool arm is lowered, a follower at the headstock end of the chasing bar engages a leader, driven by gears from the spindle, to move the bar and attached tool longitudinally in accordance with the pitch of the leader-follower combination chosen. The chasing-tool arm can be located anywhere along the chasing bar and the threader length which can be cut at one time is 4¼ in. At the end of the desired threaded length, the operator swings the chasing arm up, lifting the tool from the work and the chasing bar counterweight keeps the arm in a raised position. A compression spring returns the chasing bar longitudinally to its original position for the next cut or the next piece.

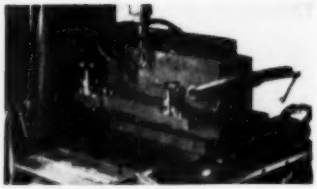
*The Warner and Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio*



## Vulcan Corner Draw Press Eliminates Welding, Finishing

By drawing one corner at a time, this hydraulic drawing press eliminates the need for hand welding and metal finishing operations, as well as the need for separate dies for each size panel. The flat sheet is placed in position in the Vulcan-Draw, the operator steps on the actuating panel, and in a few seconds is released with the corner completely drawn and finish sized. Because only one corner is dealt with at a time, various corner radii covering different-styled panels can all be fabricated in the same equipment. Tooling amounts to simple single-corner punch and die which can be changed within a few minutes when different corner shapes are to be formed. Most any radii and any panel size from 15x18 in. to the largest panel handled can be formed from the flat sheet as received from the steel mill punch and die can be changed within a few minutes.

*The Vulcan Tool Co., 730 Lorain Ave., Dayton, Ohio.*



### Precision Angle Plates Cut from Granite

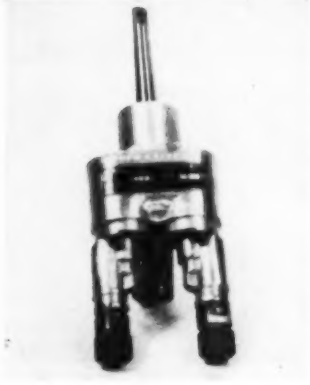
Precision angle plates of black granite are made to a tolerance of 0.00005 in. per 12 in. Illustrated is an application of a 6x9x12-in. angle plate on a jig borer. Plates are also used for inspection work on surface plates and can be made with any desired number of finished faces. These precision angle plates are generated in sets of three by hand-lapping process.

*Rahn Granite Surface Plate Co., 1149 Platt Circle, Dayton 7, Ohio.*

### Twin-Wheel Tool Grinder for Carbide, High-Speed Steel Tools

Type 10TD twin-wheel wet or dry tool grinder is for carbide, stellite, and high speed steel tools. Graduated independent-tilting tables tilt 15° above and 30° below the horizontal. Hinged structural-steel wheel guard facilitates easy mounting of new wheels. Each guard incorporates a single three-way coolant control valve, and two spouts for each wheel. Crank handles at the top are for independent forward wheel adjustment. The unit is powered by 1½-hp motor for two 10-in. plate-mounted cup wheels. Type 14TD has a 3-hp motor for two 14-in. plate-mounted cup wheels. V-belts are instantly renewable without any dismantling required.

*The Standard Electrical Tool Co., 2480 W. 6th St., Cincinnati 4, Ohio.*



### Adjustable Drillheads Built with 2, 4 Spindles

For drilling operations in the metal, woodworking, and plastic industries, this drillhead makes a multiple-spindle drillpress of any make of drill unit. The two-spindle head has a close-center setting of 0.750 in. and a wide-center setting of 2.062 in. The four-spindle unit has center settings ranging from ⅞ to 2.378 in. The drill head is built with either a straight shank driveshaft or a No. 1 Morse taper driveshaft. All bearings and gears are serviced by force-feed oiling.

*Aiman's Machine Tool Engineering Co., 109 So. Broadway, Pendleton, Ind.*

# Want to cut costs on parts like these?

*Broaching has cut costs on every one of these parts, as on many hundreds of others, reducing floor-to-floor time, cutting idle time of machines and operators for tool changes, improving accuracy and maintaining it. It's really remarkable how little time Colonial broaching equipment takes to pay for itself.*

PIONEERS OF H.S.S. BROACHING

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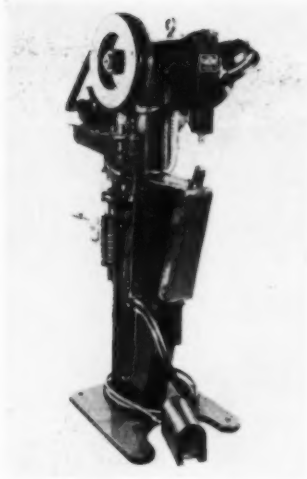
Have a Colonial Representative check over your parts for ways and means to cut costs by broaching. Write or wire now, before you forget it.



## Under-Feed Clincher Eliminates Transfer Ram

The Tomkins-Johnson Underfeed Clincher is available in a standard model with vertical anvil and anvil guide, and a special model with inclined anvil and anvil guide. Because nuts are fed from underneath the work there is no transfer ram to strike the work if it is not removed from the machine after each nut is set. Clinch nuts are loaded into a hopper at the top of the machine which feeds them by means of an inbuilt underfeed mechanism to the anvil. Capacity of the standard machine is 9/16-in. OD to ¾-in. OD D-type clinch nuts, 17/32 to 29/32-in. square "Case"-type clinch nuts, and extruded clinch nuts. Range of throat depths is 8 to 36 in. inclusive. Machine is fully automatic and is controlled by a single pedal. Output is limited chiefly by the speed at which the operator can feed work to the machine.

*Tomkins-Johnson Co., Jackson, Mich.*

## Onsrud Air-Turbine Hole Grinder Operates up to 50,000 RPM

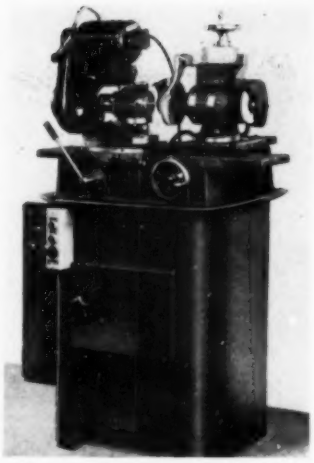
The Onsrud D1-S precision hole grinder is a high-speed air-turbine motor, mounted on a Chandler boring and facing head. It can be mounted on jig borers, vertical and horizontal milling machines, boring mills, lathes, surface grinders, internal grinders, and drill presses. Operating on line pressure of 100 psi and consuming 8 cfm the unit attains a speed of 50,000 rpm. The head slide may be adjusted for off-center position from 0 to 1 in. in steps of 0.0001 in. Head adjustment permits grinding holes up to 2¾ in. dia.

*Onsrud Machine Works, Inc., 3921 Palmer St., Chicago 47, Ill.*

## Compound-Angle Vise for Grinding, Milling, & Drilling

Joints of this compound-angle vise swing 180° in either direction and are adjusted by socket-head screws. Materials up to 1½ x 2½ in. can be held in the unit. To convert the swivel vise to a straight-drill vise, it is only necessary to remove four Allen cap screws.

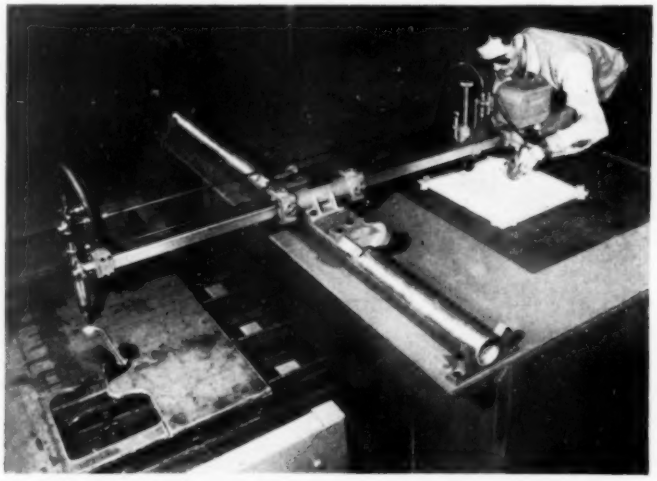
*En Fab Inc., 338 Parsons St., Kalamazoo, Mich.*



## D-S Relief Tool Grinder for Volume Production Tool Work

A GE Thymotrol drive on the D-S Radial Relief tool grinder gives stepless speed control through 18 to 150 rpm at the turn of a dial. A complete self-contained coolant system with tank and pump is built into the unit. Motorization presents no interference with the regular mechanical operation of the fixture. Cams for tools of 1 to 14 flutes can be readily interchanged as can collets.

*D-S Grinder Div., Royal Oak Tool & Machine Co., 621 E. 4th St., Royal Oak, Mich.*



OXYACETYLENE shape-cutting machine cuts steel up to 8-in. thickness in any shape within a 56 x 32-in. area at speeds ranging from 3 to 30 in. per min. Length of cutting area can be extended by adding tubular rail extensions. The Airco No. 3 monograph weighs 110 lb and the tubular rail an additional 35 lb. The unit is priced at $695— *Air Reduction Sales Co., 60 E 42nd St., New York 17, N. Y.*

# Which way do you DRILL DEEP HOLES ?

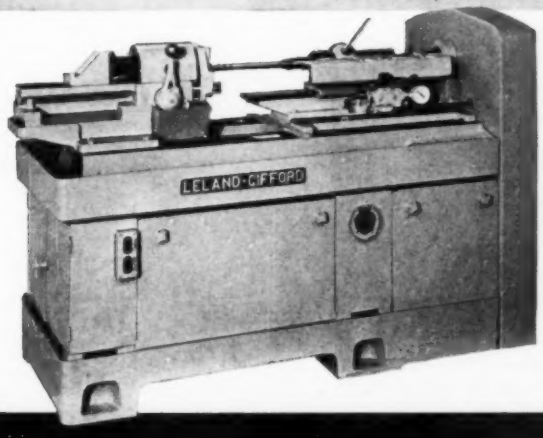
The "DRILL-KILLER" way

Keeps the drill cutting until it cries "uncle". RESULT: flutes and holes clogged with chips, coolant crowded out or burned away, drills run off, cut slowly, dull quickly, break frequently. Production down, costs up.

The Safe, Accurate LELAND-GIFFORD WAY

Patented *Step by Step* Hydraulic Feed automatically retracts the drill at frequent, predetermined, *safe* intervals to clear the chips and replenish coolant. RESULT: straight holes, drills stay cool and sharp, more holes drilled between grinds, less drill breakage. Production up, costs down.

**If you drill holes from 4 to 60 or more diameters in depth, it will pay you to look into the LELAND-GIFFORD METHOD. Write for complete information.**




A Leland-Gifford Single Spindle, Self-Contained, Horizontal Deep Hole Drilling Machine. The patented Leland-Gifford *Step by Step* Hydraulic Feed can be furnished for angular or vertical as well as horizontal deep hole drilling—with infinitely adjustable feed rate and overload protection plus automatic stop and reset — in steps and total traverses to meet your requirements.

**PRODUCTION MEN**

*Get This Handy Slide Rule*

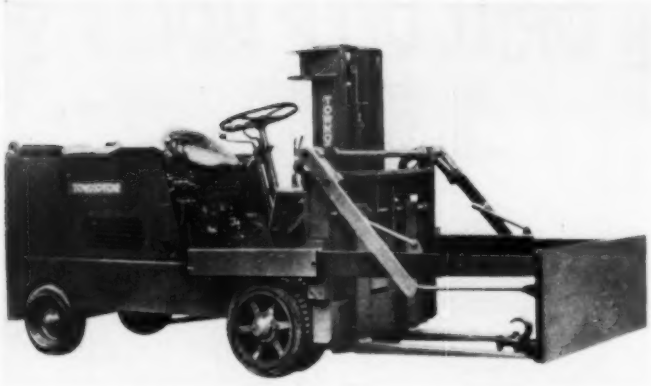
A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.

# LELAND-GIFFORD

*Drilling Machines*

WORCESTER 1, MASSACHUSETTS, U.S.A.

CHICAGO 6, 565 W. Washington Blvd.; DETROIT 26, 1533 Dime Bank Bldg.; CLEVELAND 1, P. O. Box 5547; NEWARK 2, Industrial Office Bldg.; ROCHESTER 1, Commerce Bldg.; LOS ANGELES 14, 734 So. Spring St.



## Heavy Dies Handled By Fork-Lift Trucks

Towmotor Unloader, for carrying heavy dies to and from the die table, has a capacity of 8900 lb at 25-in. load center and a lift height of 72 in. To remove the die from the table of a press, a length of chain is passed around the die and linked to hooks at each side of the pusher plate. By retracting the Unloader arms the die is pulled onto the truck forks. Dies are unloaded by merely extending the hydraulically operated steel pusher plate.

*Towmotor Corp., Cleveland, Ohio.*

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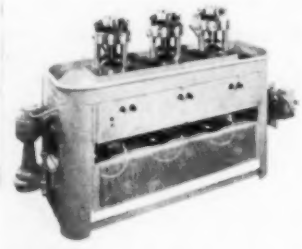


### Cam Replaces Lead Screw In Automatic Tapping Machine

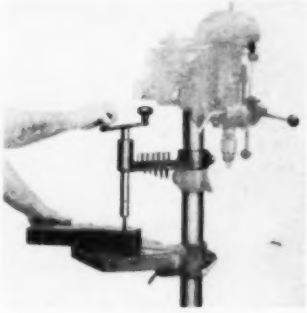
Adaptable for use of collapsible taps ranging in size from 1½ to 4 in., the Tapmaster No. 40, machines the bottom surface of the work during the tapping cycle. This is made possible by means of cam instead of lead-screw actuation of the tap, which allows a rise after the tapping operation so that facing or chamfering of the lower surface of the work can be accomplished by tools attached directly to the tap. The collapsible taps are said to step up production to 500 pieces per hr. and to eliminate the abrasions that occur on the chasers of solid taps during the threading-out process. Air fixtures, holding the work, are custom made for each individual job. Time allowance for changing work is between three and five seconds when the machine is runnnig fully automatic.

*D. H. Prutton Machinery & Tool Co., 5295 West 130 St., Cleveland, Ohio.*

### Midget Graham Transmission Affords Fine Speed Adjustment

When driven at 2700 rpm, Model 10 Midget variable-speed transmission delivers speeds from 1800 rpm to zero. At 1800 rpm input, the unit gives speeds from 1200 rpm to zero. Torque transmitted is 50 in.-oz. Built-in reduction gearboxes with ratios from 5:1 to 1000:1 are available, making a compact package of variable-speed drive and gear reducer in a single unit requiring only four mounting screws and delivering torque up to 250 in.-lb. The transmission may be obtained with micrometer control for fine adjustment.

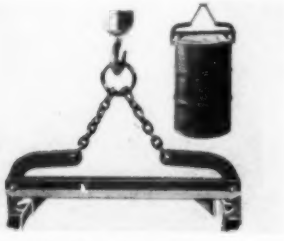
*Graham Transmissions, Inc., 3754 N. Holton St., Milwaukee 12, Wis.*



### Hand Tapping Unit Mounts on Drillpress Column

Said to both eliminate tap breakage and to speed up tapping in the toolroom and die shop, this Paragon hand-tapping machine can be mounted on the drillpress column as a permanent fixture in a few minutes. By utilizing the drillpress table and column, a precision tapping machine with adjustable tap to table clearance from 0 to 48 in. is obtained. A 3½-in. spindle guide bearing assures right-angle tapping at all times and the unit offers 7½-in. depth of thread. The Paragon precision tapping machine comes equipped with 7 quick-change tap adapters including 8-32, 10-24, ¼ in., 5/16 in., ⅜ in., 7/16 in., and ½ in. sizes.

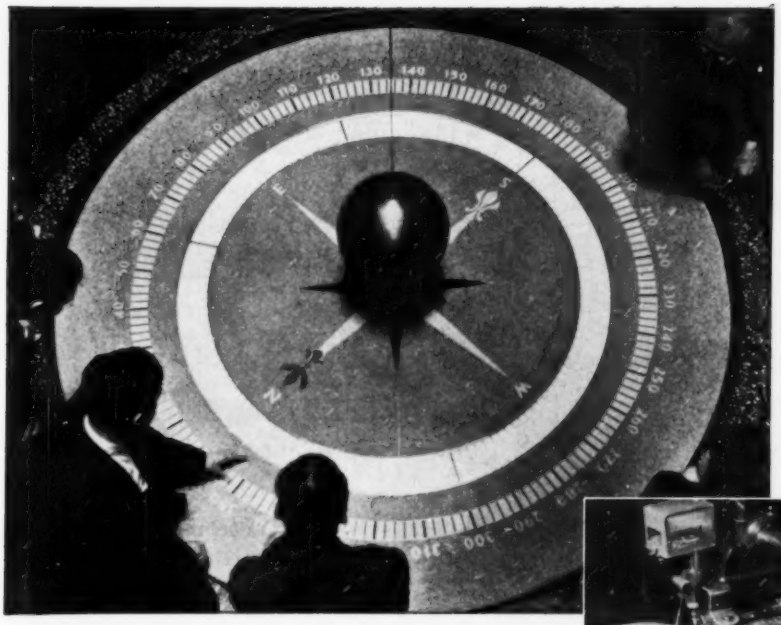
*Paragon Metal Products, 416 So. Broadway, Los Angeles 13, Calif.*



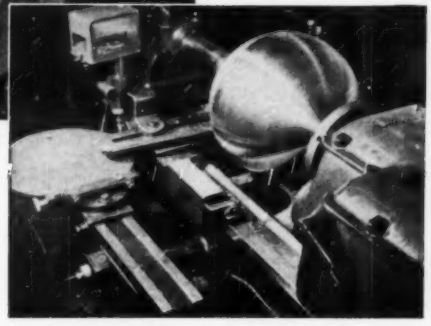
### Lifter Handles Drums in Vertical Position

Of all steel construction with heavy-welded chain, this lifter handles open and closed steel drums in a vertical position. The unit is so designed that an increase in the load weight tightens the grip of the drum jaws.

*Palmer-Shile Co., 16019 Fullerton Ave., Detroit 27, Mich.*



Foucault Pendulum, Chicago Museum of Science & Industry.



Turning perfect hollow sphere for Foucault Pendulum on Monarch Tracer-Controlled Lathe, circa 1935.

# "WE DID IT THEN... WE CAN DO IT AGAIN"

## with a Monarch Tracer-Controlled Lathe

More than fourteen years ago, the Chicago Museum of Science and Industry came to us with a machining problem no other lathe builder had been able to solve.

We solved it.

What they wanted was a perfect, hollow, bell-bronze sphere, machined to the exacting tolerances required in astronomical physics—for use as a Foucault Pendulum, to demonstrate the earth's rotation.

The important thing is not that we could bore and turn a perfect sphere, with a maximum variation in wall thickness of only .001"—or that this same sphere is still on display—and that we can still turn spheres. (You may never need a perfect sphere in your business!)

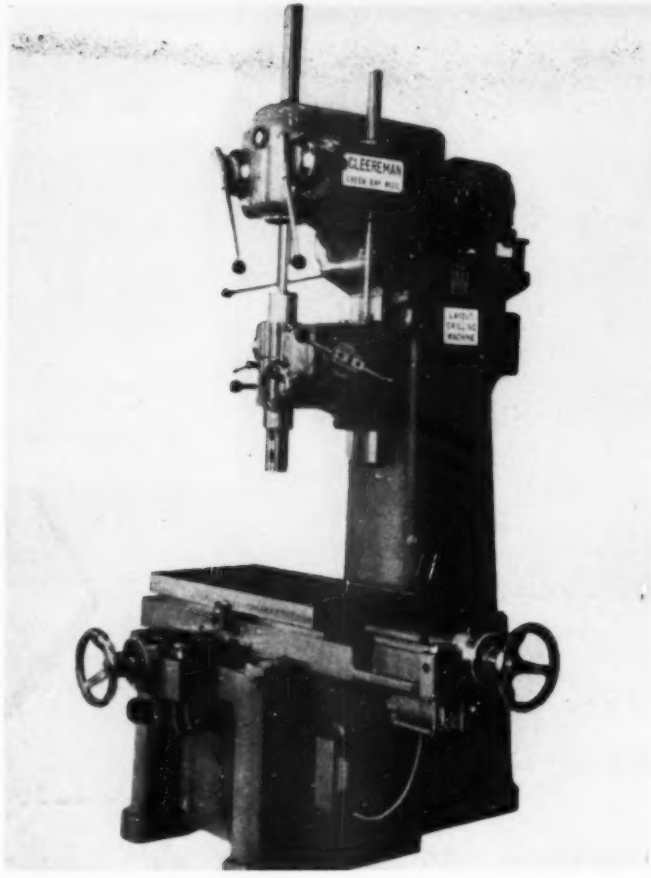
But it *is* important to you that intricate, accurate contours can be turned on a lathe—and that we've been doing it for fourteen years—and more. Actually, we're now in our twentieth year of building tracer-controlled lathes; we pioneered the process. In that time we've built over 2000 such machines—an unequalled record of experience.

We have the experience and the only *complete* range of sizes and types of tracing mechanisms being built today. Put this combination to work in your plant for "*peak production at a profit*".

ACCURACY · ECONOMY · LONG LIFE
Monarch
TURNING MACHINES

**THE MONARCH MACHINE TOOL CO., Sidney, Ohio**

**FOR A GOOD TURN *FASTER* —— TURN TO MONARCH**




## Layout Drilling Machine Features High Accuracy

The Cleereman layout drilling machine is for handling work requiring more accuracy than is possible with a drilling machine but not requiring the extreme precision of a jig borer. Equipped with a combination boring and drilling spindle with No. 4 Morse taper, the machine does drilling, boring, tapping, reaming, milling, and similar operations. A spindle binder on the sliding head and a retaining-key slit in the spindle nose provides for milling operations. The sliding head has a friction-type feed clutch with automatic adjustable depth kickout.

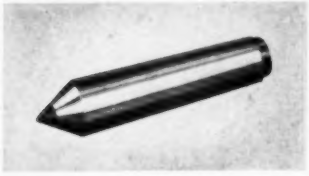
Movements of the saddle and table are controlled by hardened and ground precision lead screws accurate to 0.0001 in. and a cumulative error not to exceed 0.001 in. in 24 in. Six-in. micrometer dials are graduated to 0.001 in. and verniers to 0.0001 in. Automatic safety stops are provided at the extremes of travel and power rapid traverse to table movements is an optional feature.

*Cleereman Machine Tool Co., Green Bay, Wis.*

## Attachment Adapts Punch Press For Shearing Operations

With the Diamond shearing-die attachment, Model 3048 Multi-Max Punch Press can be converted into a 10-gage, 48-in. power squaring shear in approximately 15 min. Adjustable front and back gages on the attachment are of identical design to those on the Diamond power squaring shears. Hold-downs are of one-piece stripper-type spring-loaded construction. The shearing-die attachment is mounted in an all-steel die set with two, 2-in. diameter hardened and ground leader pins. Slope per foot of lathe is $\frac{3}{8}$ in. Attachment weighs 1075 lb.

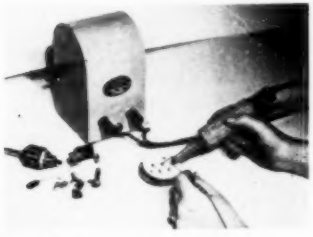
*Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif.*



## Lathe Centers Made with 60° Tungsten-Carbide Tips

Available with standard No. 2 and No. 3 Morse taper shanks South Bend lathe centers 60° tungsten-carbide-tips are said to be much harder than the hardest tool steel point. They are recommended by manufacturers for jobs requiring high spindle speeds, long continuous cuts, and heavy roughing operations.

*South Bend Lathe Works, South Bend 22, Ind.*



## Luma Soldering Tool Requires No Warm-Up

Operating on the resistance-heating principle, this tool will accommodate electrodes of 3/32-, $\frac{1}{8}$-, and 5/32-in. in either the single- or double-contact construction. Soldering heat is instantaneous, the tool being ready for immediate use upon turning on the primary switch. The unit can be connected to any convenient ac outlet of proper voltage and cycle. Energizing current is less than 10 watts. The tool can be furnished for operation on 115- or 230-volt, 60-cycle ac current.

*Luma Electric Equipment Co., Toledo 1, Ohio.*

# MUCH ELECTRICAL MANUFACTURING MAGIC BEGINS HERE

● One of the best known manufacturers of air circuit breakers in the country is the I-T-E Circuit Breaker Company, located at 19th and Hamilton Streets in Philadelphia. From its inception the company has displayed unusual receptiveness to new ideas, whether from within or without; hence it has done its share of pioneering, and perhaps more. Revere is proud to play a part in its progress, through close collaboration with I-T-E engineers, production men, and the purchasing department. The extensive use of Revere Extruded Shapes is but one result of our mutual attack upon I-T-E problems, which the company is good enough to say has saved a great deal of money, as well as made possible a better product... Perhaps similar results would be obtained if you gave us the opportunity to place our knowledge as well as our metals at your disposal. Why not inquire?

**REVERE**

**COPPER AND BRASS INCORPORATED**

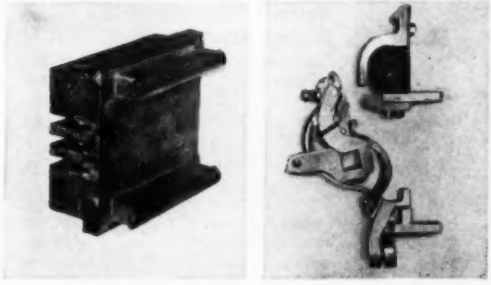
*Founded by Paul Revere in 1801*

230 Park Avenue, New York 17, N. Y.

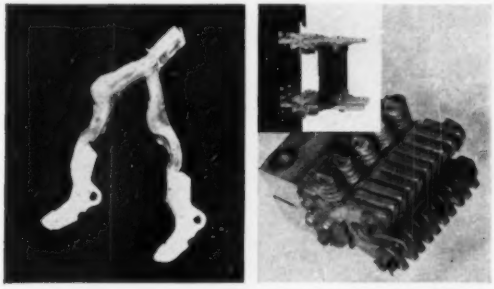
• • •

*Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.*

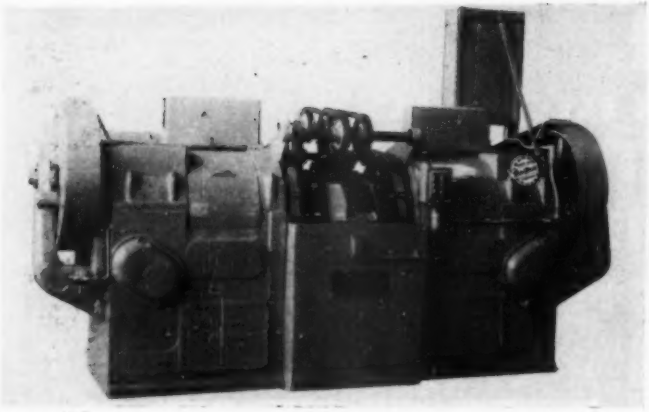
*This is but a part of the I-T-E Stock of Revere Extruded Shapes in copper, brass, manganese bronze, and aluminum. I-T-E is a great advocate of extruded shapes, from long experience finding them markedly superior in uniformity, strength, and economy due to the fact that a great deal of machining is avoided.*



(*Left*) I-T-E Contact Block made from an extruded shape. This was formerly extruded in electrolytic copper; changing to Revere Free-Cutting Copper resulted in a saving of 30% in machining time. (*Right*) I-T-E "K" Breaker, Main Contact Assembly in open position. This is an especially interesting assembly, since it shows no less than eight extruded shapes in copper and bronze. Use of these shapes makes the assembly more compact, stronger, lighter, and considerably more economical to produce. The contacts are silver alloy, and the unit is silver plated.... In addition to supplying I-T-E with extruded shapes, and strip, Revere furnishes rolls, bar, rod, sheets, in a wide range of non-ferrous alloys, and seamless brass tube.



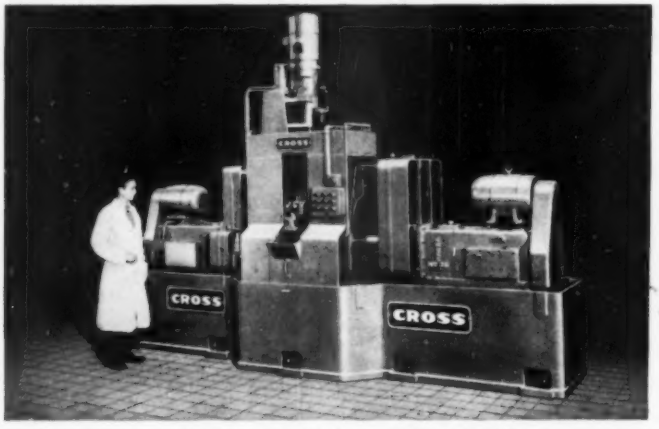
(*Left*) Main movable Contacts and Flexible Connectors in an I-T-E "K" Type Circuit Breaker. The two contacts are made from Revere Extruded Shapes. Revere and I-T-E collaborated closely on the specifications for the thin-gauge copper strip for the pigtails, working out the correct gauge and temper to avoid notch effects and cracking of the connection at the braze. (*Right*) Main Separable Contacts from an I-T-E Type "LG" Circuit Breaker. These are stamped from Revere Copper Strip with the temper specially controlled to eliminate a de-burring operation previously found necessary to obtain edge surface suitable for electrical contacts. (*Inset*) Back view of "K" type Breaker showing a similar type of contact.



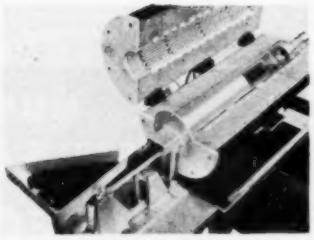
## Horizontal Machine Threads Both Ends of Suspension Arms

Twelve spindles provided with leadscrew feed, carrying 6 die heads on each end, facilitate continuous threading of work pieces from both ends on the Rotomatic Type-GG double-end horizontal threading machine. Continuity of thread is maintained by leadscrew bushings always being in the same relation. The operator loads the workpiece at the open station while the machine is in operation. Workpieces are held by equalizing jaws in the fixture through a chain clamping arrangement during the cycle. When threading operation is completed, die heads are open by an outside contact ring, leadscrew screw is released, the spindle is returned to the starting position, fixtures are automatically unclamped, and the work is rolled into the discharge chute. Production as high as 1500 pieces per hour is possible on these machines.

*Davis & Thompson Co., Milwaukee 1½, Wis.*



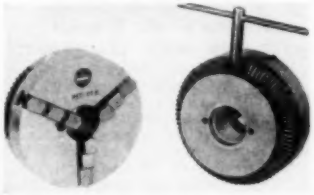

**SPECIAL UNIT** for machining axle shift forks performs 12 different operations on 87 pieces per hr, run by one unskilled operator. Four stations are provided. Operations include drilling large and small holes in the boss of the shift fork, reaming large holes, milling two bosses, and drilling and reaming of four holes in the fork while the ends of the large hole are spotfaced and chamfered. The machine is equipped with fluid motor drive for power indexing, hydraulic feeds, hardened and ground steel ways and automatic pushbutton working cycle—*The Cross Co., Detroit 1, Mich.*



### Shaker-Hearth Furnace Heats Small Parts to 1700 F

There are no bearings, moving hangers, or other conveyor parts in the heating chamber of the Hevi Duty shaker-hearth furnace thus eliminating maintenance and heat loss due to trays, chains, or belts. Parts to be bright hardened, bright carburized, or bright dry cyanided, are loaded into a fabricated steel hopper. From here they are fed to an alloy hearth plate extending into the furnace heating chamber to a position directly over a quench chute. Rate of travel along the hearth plate is regulated by a variable-speed driven mechanism. Either batch-type or continuous-conveyor-type oil quenching equipment can be supplied. Capacity is 15 to 35 lb per hr.

*Hevi Duty Electric Co., Milwaukee 1, Wis.*



### Westcott Universal Chuck Employs Reversible Jaws

Said to combine the speed of a lever-operated chuck with the powerful grip of a pinion-operated unit, the Westcott 75 three-jaw universal chuck has solid reversible jaws. Work is locked into place by inserting the end of a wrench stem into any one of six holes in the outside diameter of the scroll and then rotating the it rapidly by lever action. A final tight grip of the jaws is obtained by means of six additional holes adjacent to the scroll and a specially-designed pinion which engages bevel gears at the back of the scroll. This chuck is threaded for direct attachment to 1½-in. 8-thread lathe spindles. The body of the chuck is 5 in. in diameter and the unit weighs 8½ lb.

*Westcott Chuck Co., Oneida, N. Y.*

# Make this note on your Xmas List:

All through the dazzling displays, from toys to TV sets, you'll see . . . time and time again . . . the familiar face of the American Phillips Cross Recessed Head Screw. And whenever you see it, you're looking at a top product in its line . . . one that's obviously an exceptionally good buy because it's put together to stay, to withstand vibration and strenuous daily use. What's more, you can be sure that the lucky one who gets your gift *will see it the same way.*

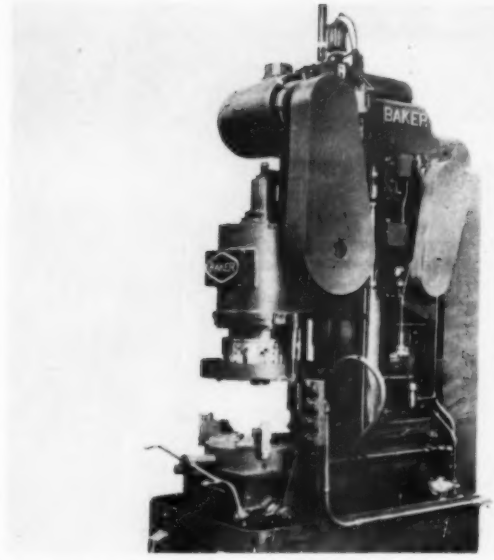
Yes, American Phillips Screws are one of the most reliable outward signs of built-in quality. And if *you* are concerned with the manufacture of any product, then you may well have a far happier New Year in store for you, if you will let us show you how . . . in your own plant as in all others . . . *American Phillips Screws always cost least to use.*

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

**AMERICAN SCREW COMPANY, Main Office: Providence 1, R. I.**
Plants at Willimantic, Conn., and Norristown, Pa.
Warehouses at: Chicago 11: 589 E. Illinois St. Detroit 2: 502 Stephenson Building

# AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

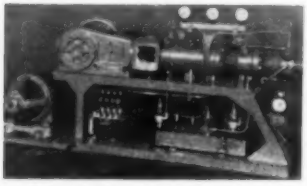


## Baker Machine Bores, Reams, Threads 3- to 16-in. Pipe Flanges

Equipped with Murchey special full-receding pipe taps, the Baker 30HO4 machine is reported to greatly reduce operating time in boring, reaming, threading, and counterboring cast-iron pipe flanges. Employing a three-jaw scroll and chuck, this machine will handle flanges from 3- to 16-in. pipe size. The machine has a worm-and-worm gear-drive head and is arranged with sliding gears providing two speeds plus pick-off speed change gears.

The operating cycle starts with rapid advance of saddle through hydraulic feed pressure to a predetermined point where the taper reaming operation begins. A half nut closes providing positive leadscrew feed of the saddle for reaming, tapping, and counterboring operations. After completion of the operations the half nut opens and the saddle is rapidly returned to a raised position by hydraulic pressure. The cycle is controlled through limit switches.

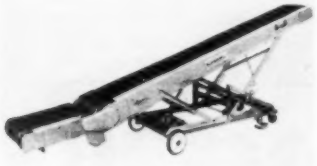
*Baker Bros. Inc., Toledo, Ohio*



### Semi-Portable Compressor Produces 6000 psi

Pressures up to 6000 psi with displacement of 1 to 3 cfm are produced by this 4-stage Norwalk compressor. The unit can handle any gas that can be pumped and is available on wheels or on solid base.

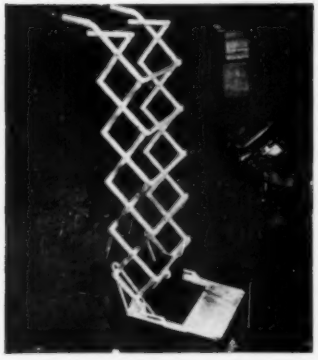
*Norwalk Co., Inc., South Norwalk, Conn.*



### Portable Belt Conveyor Available wth 10-, 15-ft Booms

Available with 10- and 15-ft booms, the Trojan portable belt conveyors can handle a maximum total load of 400 lb. Belt width is 12 in. and overall width of conveyor is 2 ft 8¼ in. Two swivel casters on the under carriage insure easy maneuverability and floor locks hold the conveyor securely in place. It is furnished with either a ½- or ¾-hp motor to suit varying needs. Special feeder section, which can be set in position at angles independent of the main belt, increases effective length by almost two feet.

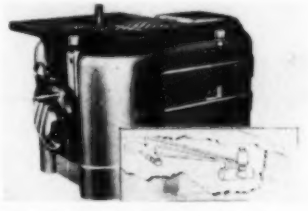
*The E. W. Bushman Co., Winton Place Station, Cincinnati 32, Ohio*



### FOLD-A-WAY Hand Truck Sports Lazy-Tongue Handles

Weighing only 25 lb, the FOLD-A-WAY hand truck, which pulls open like an accordion to a full height of 42 in., can carry 700 lb. A glider bar is provided for taking loads up or down stairs and the rubber wheels are placed inside the frame to eliminate danger of catching passing objects. The truck is available with either a straight back, or round back for barrels or kegs. It is priced at $25.50 FOB. Elizabeth, N.J.

*Business Equipment Specialists, 19 West 44th St., New York 18, N. Y.*



OILING SYSTEM for Boyar-Schultz No. 1 bench-model profile grinder consists of a reservoir with three distributing lines. One goes to the spindle and one each to the two ways on which the operating mechanism operates—*C. W. Munger, 123 North Sangamon St., Chicago 7, Ill.*

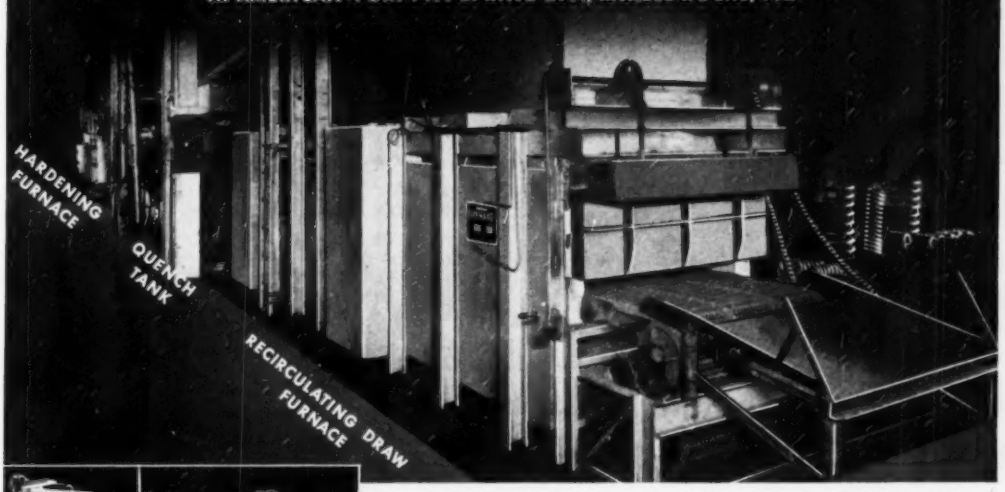
No. 97 of a Series of Typical Installations

# Sunbeam STEWART

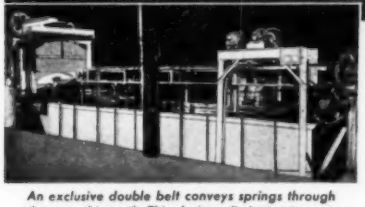
THE BEST INDUSTRIAL FURNACES MADE

## HEAT TREATING RAILWAY AND INDUSTRIAL SPRINGS

At AMERICAN-FORT PITT SPRING DIV., McKEES ROCKS, PA.




*Overall view of the integrated Sunbeam Stewart Harden, Quench and Draw heat treating line (approximately 100 ft. long) for helical springs. This installation is capable of handling 3,500 lbs. per hour.*



*An exclusive double belt conveys springs through the quenching oil. This design eliminates impact, permits an even quench along the longitudinal axis of the spring.*

*Overall dimensions of the Hardening Furnace are 11½' by 30½', with a usable hearth space of 54" by 25'.*

**This is Number 97 in a series of typical installations showing how Sunbeam Stewart Furnaces are helping manufacturers reduce costs and keep themselves competitive. These installations also demonstrate the wide variety of specific requirements in the metal-working industry Sunbeam Stewart Furnaces are designed to meet.**

Springs manufactured by American-Fort Pitt Spring Division of the H. K. Porter Co., Inc., are such as those used in the agricultural implement and railroad fields, with a monthly production of about 700 to 800 tons.

To eliminate distortion of springs due to shock and impact, a double belt conveyor automatically delivers springs from the Hardening Furnace *through the quench tank* to the Draw Furnace. The upper belt runs slack so that its weight holds the spring firmly until quenched.

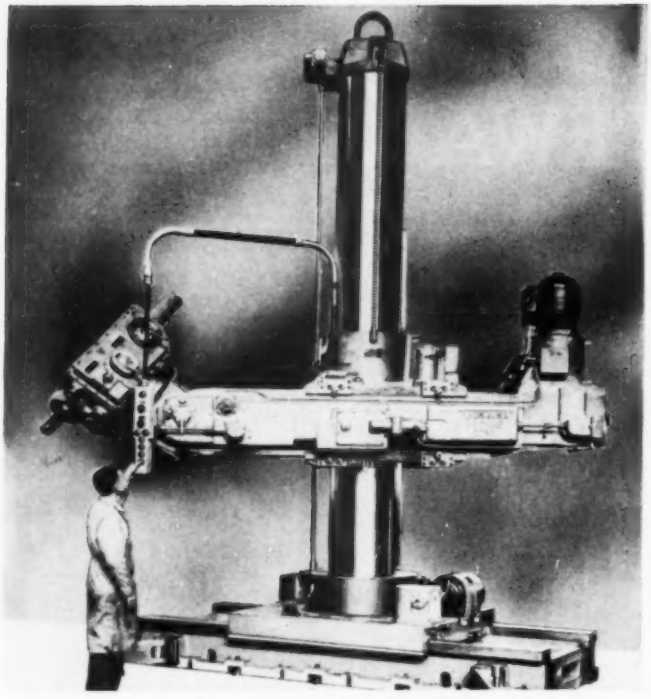
It will pay to consult Sunbeam Stewart on your heat treating problems. In addition to continuous conveyor units, Sunbeam Stewart builds a full line of standard furnaces and galvanizing equipment.

**SUNBEAM STEWART INDUSTRIAL FURNACE DIVISION of SUNBEAM CORPORATION**

(*Formerly* CHICAGO FLEXIBLE SHAFT CO.)

***Main Office:*** **Dept. 119, 4433 Ogden Ave., Chicago 23** — ***New York Office:*** **322 W. 48th St. New York 19** — ***Detroit Office:*** **3049 E. Grand Blvd., Detroit**
***Canada Factory:*** **321 Weston Rd., So., Toronto 9**

*A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM STEWART furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM STEWART engineer will be glad to call and discuss your heat treating problems with you.*



## Full Universal Drilling Machine Has 97-in. Radial Reach

Capable of performing radial, horizontal, or angular operations such as drilling, tapping, boring, spotfacing, or reaming on a production basis, this heavy-duty full-universal Kaukauna drilling and tapping machine provides a 97-in. radial reach with the spindle in vertical position. It will drill holes at any point in a range from 18 to 134 inches above the floor with the spindle in a horizontal position. The machine is equipped with a 4-in.-dia. nitrided spindle with 18 in. of manual and power feed. A choice of nine speeds, ranging from 25 to 800 rpm is afforded. Spindle drive-power ranges from 10 to 20 hp.

The spindle head swivels 360° on the trunnion and the trunnion rotates 180° on the rails. Both swivel units are power driven. The column base is carried on a heavy runway which provides 48 in. of horizontal movement by power with both rapid traverse and inching in either direction.

*Kaukauna Machine Corp., Kaukauna, Wis.*

### Water-Soluble Cutting Oils Reduce Oil Consumption

Water-soluble "501 OILSAVER" cutting oils, mixed 1 part to 400 parts of water, is said to allow 50% reduction in oil, with no loss in coolant standards. Non-inflammable and nontoxic, this compound is further said to reduce oiliness of coolant mixtures, leaving less grease to wipe away.

*The Beacon Rust Proofing Mfg. Co., 20 East 33rd St., New York 16, N. Y.*

### High-Speed Grinder Operated by Air-Cooled Motor

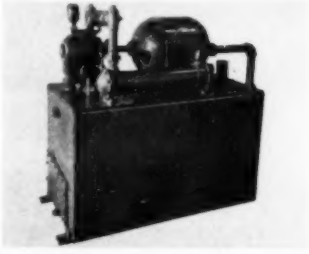
Operating on 110-130 ac-dc current at 38,000 rpm, the Roto-Master Hi-speed grinder is equipped with a simple wrenchless collet-type chuck and contains sealed micro-precision ball bearings lubricated for the life of the tool. Collets are interchangeable for 3/32 and ⅛ in. The motor is cooled with an air stream of 5400 cfm. The Roto-Master weighs 13 oz and is 6¾ in. in length.

*Metal Removal Co., 1014 N. Ashland Ave., Chicago 22, Ill.*

### Bruning Drafter Has Ball Joints on Both Arms

New drafter mechanism which overcomes gravity is said to combine all the functions of T-square, straightedge, triangles, protractors, and scales. This drafter is equipped with the Bruning "Equipoise" mechanism for overcoming gravity. The unit has ball joints on both arms and increased space between the double thumb screws which fasten the drafter to the board.

*Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill.*



### Hydraulic Power Units Range from 2 to 75 hp

The standard Rucker units, over 40 models in all for industrial fluid power requirement, range from 2 to 75 hp with special models built for any power requirement up to 300 hp. Pressures are 1000 to 2000 psi with special models up to 10000 psi. Units come with single- or dual-pressure systems and constant- or variable-volume pumps.

*The Rucker Co., 4228 Hollis St., Oakland, Calif.*

## ...10 TIMES EACH WAY!

**Chase wire for cold-heading passes this *GRUELING TEST* every day!**

As one of the means of assuring you the very best quality wire, each Chase copper-alloy wire coil is subjected to this severe twist and reverse twist test.

No seams, slivers or other surface physical defects can hide from *this* searching test. And it's just one of many! Chase wire for cold-headed products is also subjected to a compressing or upsetting test that simulates a very severe heading operation.

In addition, Chase wire must be uniform in surface texture and color, have accurate dimensions, be precisely tempered. And there's a Chase copper-alloy wire for *every need!* Write the nearest Chase Warehouse or Service Office, and be *sure* of the best.

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*the Nation's Headquarters for*
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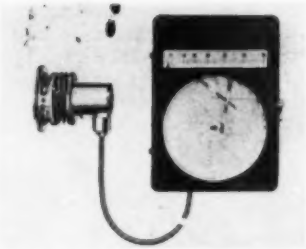
## Self-Closing Cover Converts Drums into Waste Containers

Any 30- or 55-gal. drum can be quickly converted to a fire-safe waste container by means of the Protectoseal self-closing drum cover. Fastened to steel drums by a single bolt tightening a steel band, this cover automatically closes when the temperature within or surrounding the drum reaches 160°, automatically snuffing out fire within the drum or protecting contents of the drum from outside combustion.

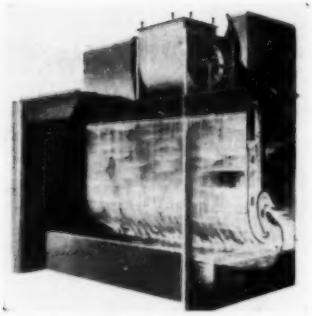
*The Protectoseal Co., 1920 South Western Ave., Chicago 8, Ill.*



## Bristol Radiation Pyrometer Indicates, Records, Controls

The Pyroviser is for indicating, recording, controlling temperatures up to 4000° F in furnaces and kilns. A temperature-sensitive head, mounted on the outside of the furnace or kiln, away from the hot zone, picks up radiant energy emitted from the surface of the object under measurement. In this way actual surface temperature measurements of the work are obtained. The unit is said to produce 99% response to temperature change within one second.

*The Bristol Co., Waterbury 20 Conn.*



## Waterfall Spray Booth Eliminates Paint Fog

Providing suction of paint-ladened air at both the top and bottom of a water curtain, the Roto-Wash spray booth is said to eliminate paint fog in the booth between spraying cycles. A large door permits easy access to the built-in fan. There are no hidden sections of the Roto-Wash booth to be maintained.

*Newcomb-Detroit Co., 5741 Russell, Detroit 11, Mich.*

## Hydraulic Elevating Positioner Mounts Variety of Work Pieces

Offered in several models the LYON-Raymond hydraulic elevating positioner has mounting plates to which various types of fixtures can be installed. The unit illustrated has an adjustable revolving arm to which products can be mounted for assembly or welding operations. Special brackets and fixtures can be designed to meet customer's particular needs when standard fixtures cannot be used. Positioner can be operated by hand or foot pump, electric power or air-operated pump. Capacity is 1000 lb.

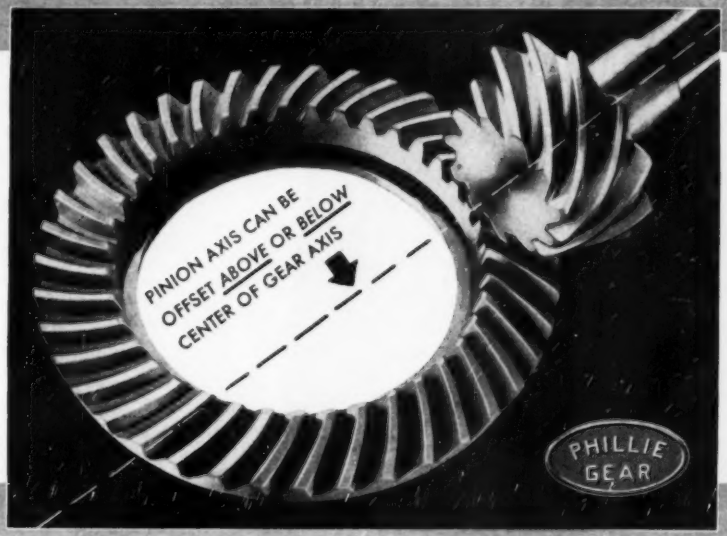
*LYON-Raymond Corp., 4758 Madison St., Greene, N. Y.*

## Rotary Finisher Provides Variable Dwell, 1-sec Indexing

Work spindle speeds varying from 50 to 150 rpm on the Hammond super Rotary Automatic machine for grinding, polishing, buffing and deburring. Dwell time varies from 1 to 20 seconds and indexing requires 1 sec. The K-34-5 model has a 34-in. table diameter, and is available with up to four heads rated at from 3 to 15 hp. K-46-6 model has 46-in. table dia, and up to five heads ranging from 3 to 15 hp. Automatic air-operated head lifters raise wheels from work before indexing.

*Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo, Mich.*

# UNEQUALED FOR HIGH RATIO, HIGH SPEED DRIVES..




# WHERE GEAR SIZES MUST BE KEPT TO A MINIMUM

HYPOID GEARS are the ideal combination for power transmission between shafts at *any angle and speed*. Actually, the unsurpassed performance of Hypoids result largely from the curvature and obliquity of teeth—assuring continuous pitch line contact and an overlapping action, which allows at least two pairs of teeth in contact at all times—smooth transfer of load from tooth to tooth (without noise and vibration) and increased load carrying capacity, due to the distribution of load over a greater number of teeth.

HYPOID GEARS are similar to spiral-bevels, but have pinion axis offset above or below center of gear axis. Gear and pinion shafts of a Hypoid pair can continue past each other . . . this direct and compact arrangement is used to advantage in steel mill, paper mill, and printing plant machinery, etc. Other advantages are: more room to place bearings on both sides of gear and pinion, and in some cases, lowered or raised position of the pinion, allowing arrangements of machinery which would otherwise be impossible.

*Send for the "Gear Book," which contains 68 pages of highly useful information; in fact, it's almost a "treatise on gears." Please use your Business Letterhead when writing for this Catalog.*

## Philadelphia Gear Works, INC.

**ERIE AVE. AND G ST., PHILADELPHIA 34, PA.**
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON
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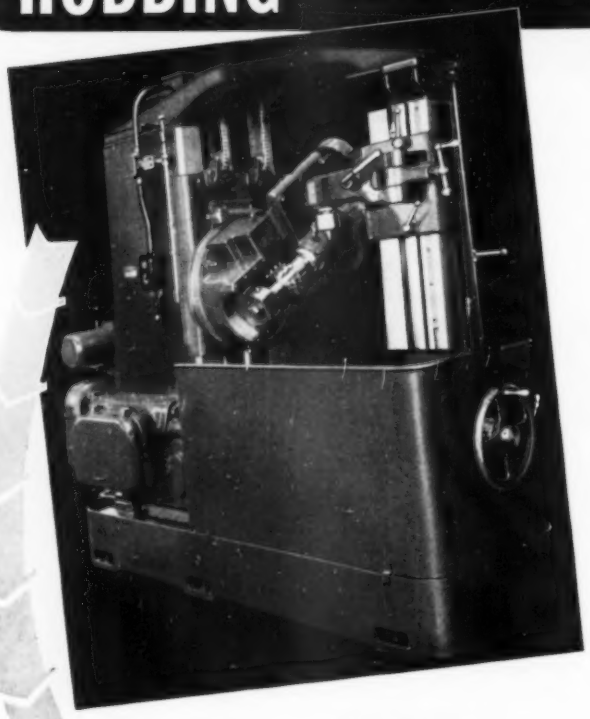
*Industrial Gears and Speed Reducers*
*LimiTorque Valve Controls*

LEES-BRADNER MODEL R

# ULTRA HEAVY DUTY HOBBING MACHINE

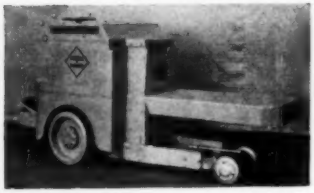


## For SPUR or HELICAL GEARS up to 1¼ DP!

*Write for detailed information*

**Maximum Outside Dia.....16"**
**Tooth Range.....5 to 100 Teeth**
**DP Range.....1¼ DP to 16 DP**
**Maximum Helix.....RH 45°—LH 60°**

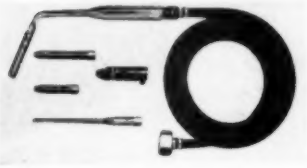
The LEES-BRADNER Company
CLEVELAND 11, OHIO, U S A



### Fork-Lift Truck for Medium-Height Lifting Range

With top-of-platform range of 12 to 36 in., the Elwell-Parker medium-high fork lift is available in capacities of from 4000 to 10,000 lb. It raises or lowers its load from minimum to maximum level in less than one minute and is equipped for all-electric or gas-electric drive. Travel speed is 4¼ to 6 miles an hour.

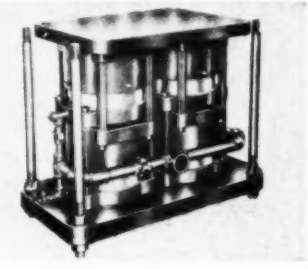
*Elwell-Parker Electric Co., Cleveland, Ohio.*



### Air-Acetylene Soldering Outfit Includes 4 Tips, 5-ft Hose

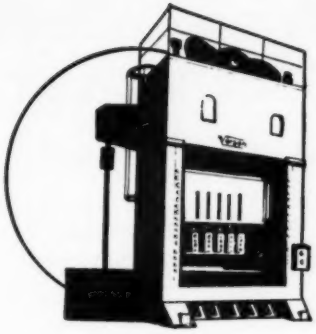
The Airco No. 75 air-acetylene outfit is for all kinds of small soldering low-temperature brazing, heading or lead-burning jobs. It is sold with four tips, 5 ft of 3/16-in. flexible hose, a soldering iron, soldering copper, and a brass torch assembly.

*Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.*



### Pneumatic Die Cushions for Large Straight-Side Presses

Working off the average shop air line, and provided with convenient pressure-lubrication fittings, these pneumatic die cushions are adaptable to large straight-side presses. Ring-holding force developed by



TRADE **Verson** MARK

# Deferred Payment Plan for the Purchase of New Equipment

In the past twenty-two years we have helped many of our clients purchase Verson Equipment with a minimum initial investment by means of our Deferred Payment Plan. As a result, theirs are modern plants, today.

Our plan is a simple one. It consists of nothing more than a moderate down payment with the balance payable in monthly installments. The interest you pay is simple bank interest. While each manufacturer's financial requirements differ, flexibility is the keynote of our plan so that all can participate.

Many of our clients who have used our plan tell us the installments "were just like paying rent." Be wise — modernize. Let modern Verson equipment pay for itself.

We will be glad to explain our plan to you.

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# *Yes*, COOLANT CLARIFICATION CAN CUT YOUR COSTS!

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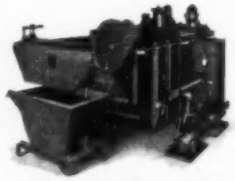
Everything to gain (nothing to lose) when you check the whole host of production savings you can make with today's advanced filtration techniques. Let Hoffman engineers show you how you lower unit costs by eliminating individual sump cleaning – by making grinding wheels and cutting tools last longer – by improved quality control. Hoffman builds a complete line of filtration products, each one designed to pay for itself quickly. Get the facts.

**FLOTATION EQUIPMENT FOR AUTOMATIC CLARIFICATION OF SOLUBLE OIL COOLANTS**

A Hoffman exclusive process that is entirely mechanical . . . aerates particles out of dirty coolant . . . requires no added material. Sludge discharged into receptacle automatically. Models from 20 to 1,000 g.p.m. Larger sizes to your specifications.



**COMPLETE RECOVERY OF USED OIL IN THE HOFFMAN OIL CONDITIONER** for hydraulic, lubricating and run-in oils. Combination cartridge filter and vaporizer removes both insolubles and solubles (air, gas, moisture and fuel dilution). May be operated separately or together. No steam or water connections. Portable, if desired. Capacities of 50 to 600 g.p.h.

**CARTRIDGE FILTERS FOR 7x18 OR 11x18 CARTRIDGES**

Wide range of sizes, for either 7x18 Navy throwaway or 11x18 repackable or throwaway cartridges. Exclusive headlifting device speeds cartridge change. With or without heaters and controls to fit your requirements.

**DISC FILTERS FOR CONTINUOUS FLOW IN SMALL SPACE**

Three sizes of this compactly designed filter will remove dirt particles from 3 to 5 micro inches. Models from 1 to 10, 5 to 50, and 50 to 125 g.p.m. No moving parts . . . minimum maintenance . . . low first cost.

**PRESSURE FILTERS FOR FINE FILTRATION**

Designed for use with approved filter-aid powders, the Hoffman line of pressure filters offer finest clarity filtering of straight oil coolants – especially those of heavier viscosity.

OTHER SPECIALIZED HOFFMAN products for coolant clarification include Vacuum Filters in a variety of sizes (many of them self-cleaning) and Vacuum Stills.

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FILTRATION DIVISION

**U.S. HOFFMAN MACHINERY CORPORATION**

211 LAMSON STREET, SYRACUSE 6, N. Y.

CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO., LTD., NEWMARKET, ONT.

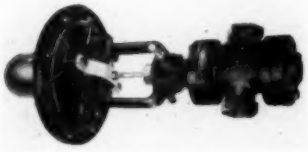

these units varies from 15 to 25 tons. Special superstructure is furnished for each installation and every die cushion is engineered for each punch-press requirement. Heavy-duty pin pressure pads are made in sizes from 28 x 36 to 34 x 48 in. and are custom made to fit individual press-bed openings.

*Dayton Rogers Mfg. Co., 2824 - 13th Ave. South, Minneapolis 7, Minn.*

## Permanent Magnet Materials Developed By G-E

Specifically for application where a high demagnetization force is present G-E Alnico 7 is recommended for use in motors, generators, and variable air-gap devices. This new magnet is said to show higher coercive force than any other grade of Alnico.

*General Electric, Pittsfield, Mass.*



## Quick Reversibility Feature Of Stabilflo Valve

Without removing it from its installation or shutting down controlled flow, the Foxboro Stabilflo valve can be changed from air-to-open to air-to-close, or vice versa, within a few minutes. No special tools are necessary. To reverse the action of the valve motor it is only necessary to remove the housing assembly, rotate it one-quarter turn and replace it.

*The Foxboro Co., Foxboro, Mass.*

## American-LaFrance Extinguishers Have 14,000 psi Shell Strength

Available in foam, soda-acid, and anti-freeze water types, these American-LaFrance 2½-gal. silicon-bronze fire extinguishers have an ultimate shell strength of 14,000 psi. The units are 2 lb lighter than the drawn-shell models they replace.

*American-La France Foamite Corp., Elmira, N. Y.*

## Neutral Salt Bath for Heat Treatment of Steels

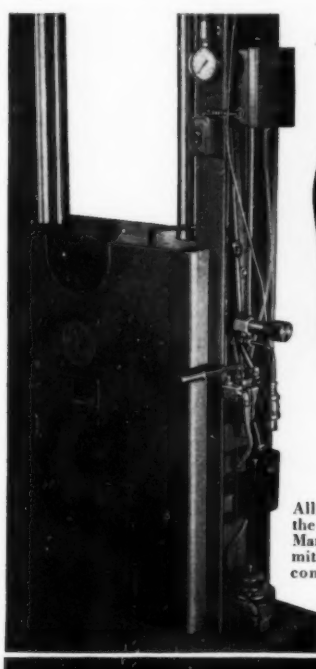
Aeroheat 1190 is a neutral salt bath recommended for the heat treatment of medium- and high-carbon steels without decarburization under severe operating conditions. It may be used

# KRW ANNOUNCES

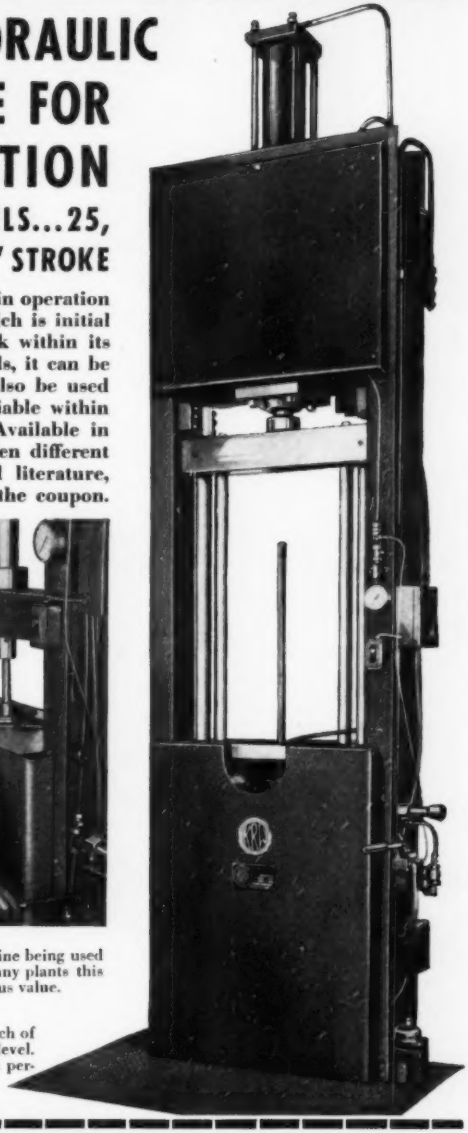
## A NEW, LOW-COST HYDRAULIC BROACHING MACHINE FOR "PUSH-PULL" OPERATION

### VERTICAL OR HORIZONTAL MODELS...25, 50, 60-TON CAPACITIES, UP TO 48" STROKE

**You have to see this new KRW Broaching Machine in operation to appreciate its many features not the least of which is initial cost. This broaching machine will handle any work within its stroke and working capacity. In a matter of seconds, it can be changed from "Push" to "Pull" operation. It can also be used as a press. Pressures and stroke are infinitely variable within rated capacity. Electrical controls are standard. Available in either vertical or horizontal models. Choice of Ten different hydraulic pump combinations. Write for detailed literature, specifications and prices of standard models. Use the coupon.**



The KRW Broaching Machine being used as a hydraulic press. In many plants this feature is a definite plus value.



All controls within convenient reach of the operator. Pressure gauge at eye level. Manually operated four-way valve permits instant and precise finger-tip control of ram. Every control readily accessible.

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**K. R. WILSON, 215 Main St., Buffalo 3, N. Y.**

**Please send information on KRW Hydraulic Broaching Machine. Capacity Req. 25 Ton ☐ 50 Ton ☐ 60 Ton ☐**

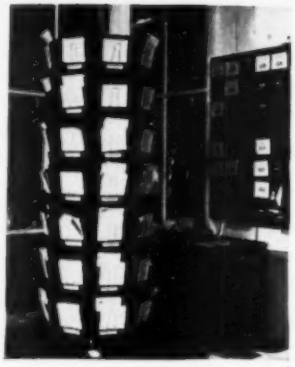
**Name**_____

**Address**_____

**City & Zone**_____ **State**_____

11

McCASKEY machine loading, production progress and costs help Mason-Neilan Regulator Co. maintain . . .

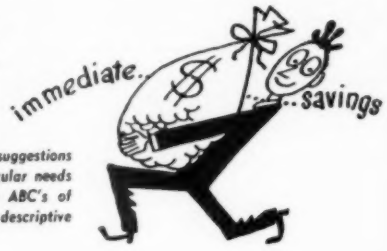


## HIGH QALUITY with LOW COSTS

The controls that produce these results include: the machine load for all machines at all times; the delivery of material to machines; the progress of each production order and the number of pieces produced daily compared with standards and schedule; the daily cost status of a thousand jobs in process; detailed costs almost immediately after their completion.

Three-copy time tickets made at "one-writing" provide identical data from the shop to three control divisions where they are immediately visualized on McCaskey Planning Boards for quick reference by planning and cost clerks.

Their systems have served thru twelve years of varying conditions. They are stream-lined today for speedy, effective control.




*Write for a demonstration and suggestions for an application to your particular needs —or send for a copy of "The ABC's of Production Control" and other descriptive folders.*

THE McCASKEY REGISTER CO.
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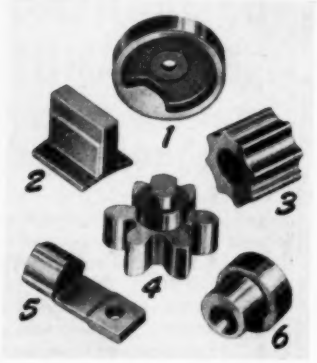
for hardening of carbon and alloy steels, reheating carburized work, annealing, brazing, and heating for austempering, martempering, and isothermal quenching. Temperature range is 1300 to 1600 F.

*American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.*




### Metal-Powder Machine Parts Produced by Wel-Met

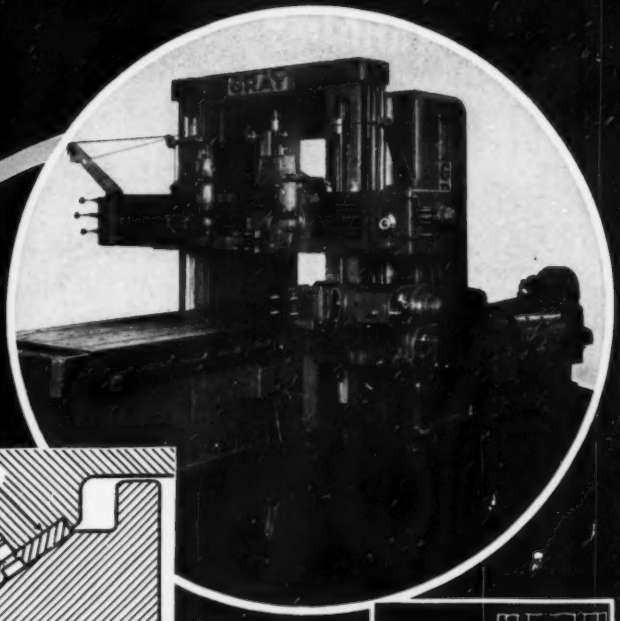
Among machine parts now produced from metal powder are (1) dash-pot plunger for heading machines, (2) generator pole-piece, (3) rotor for oil pump, (4) automobiles door-lock rotor, (5) automatic-adjustment pin from automobile brakes, and (6) feed-raising cam for sewing machines. Metal powder is said to provide decreased scoring, closer tolerances, lower cost, and self-lubrication.

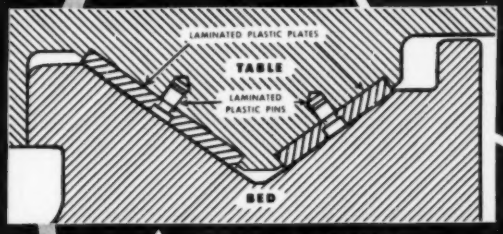
*The Wel-Met Co., 120 Gougler Ave., Kent, Ohio.*

### Furnace Retort Features One-Piece Bottom Seal Ring

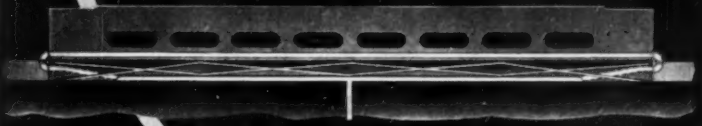
Nickel-chrome alloys are used throughout the Stanwood Retort. This unit features a one-piece bottom

# 3 OUTSTANDING GRAY FEATURES



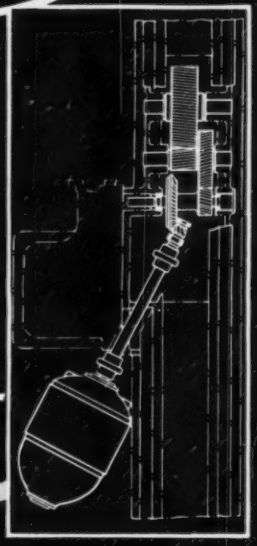



**STOP SCORING** *with the Gray Non-Metallic Ways*



**INSURE PROPER LUBRICATION** *with Gray Loop Lubrication*

**SAVE SPACE** *with the Gray Space Saver Drive*



## THE G. A. GRAY CO.

**CINCINNATI 7, OHIO**

**PLANERS - MILLING MACHINES - HORIZONTAL BORING MACHINES**

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*Noblewest*
MODERN MARKING MACHINES

- speed production
- lower marking costs

With the new Noblewest marking machines, such as Model 194 illustrated, inscriptions are *permanently rolled in*—last as long as the product itself. Noblewest also provides advantages in marking speeds with up to 500% increases and corresponding reductions in production costs. For permanent marking on your products write Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.

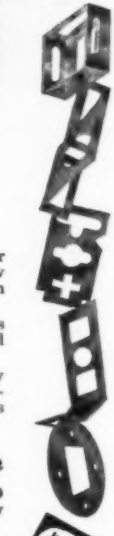
MARK IT BEST WITH NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

di-acro PUNCH

NEW DOUBLE PURPOSE PRESS

Available in two sizes, 6" and 12" throat depth



Now you can punch holes of various shapes as large as 4" diameter in 16 gauge steel—also blank, draw, emboss, form—all with the new DI-ACRO Punch. It is ideal for both experimental and production work.

The precision ground triangular ram of this double purpose press prevents punch head from turning, assuring perfect alignment at all times for accuracy in duplicated parts.

A Turret Stripper of exclusive DI-ACRO design automatically strips material from punches of all shapes. Roller Bearing cam action develops 4-ton pressure with minimum effort. Adjustable gauges assure exact location of holes.

*Send for* "DIE-LESS DUPLICATING" *Catalog*

Gives the full story of the DI-ACRO Punch, and also DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, as well as the new DI-ACRO Vari-O-Speed Powershear and Hydra-Power Bender.

DI-ACRO is pronounced "DIE-ACK-RO"

DI-ACRO "DIE-LESS DUPLICATING"

O'NEIL-IRWIN MFG. CO.

311 EIGHTH AVENUE • LAKE CITY, MINN.

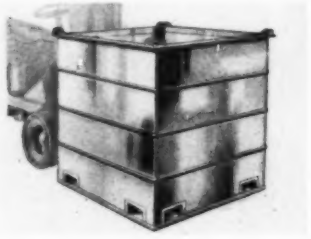
seal ring said to be of greater rigidity than the fabricated type, formerly used. Available in standard sizes, these retorts are accurately dimensioned for easy installation in furnaces.

*Stanwood Corp., Chicago 39, Ill.*

## Portable Hack Saw Powered by Electric Drill

Operated by any standard electric drill this power hack saw weighs only 21 lb and is suited for 10-in. standard hack-saw blades. At 1240-rpm. drill speed the saw makes 200 5-in. strokes per min. It will cut pipe or metal up to 2-in. dia.

*Zina Goodell Corp., Salem, Mass.*



## Storage Box Adaptable to Fork Lifts, Cranes, Hand Trucks

The North American utility storage box was conceived for use with all fork lift tractors, overhead cranes, and hand-operated pallet-bed trucks. Equipped with four corner lifting hooks, it is of 12-gage hard temper steel and has 64-cu ft capacity.

*North American Industries, Inc., 2100 N. Kolmar Ave., Chicago 39, Ill.*

## High-Speed Drills, Reamers Added to Besly Line

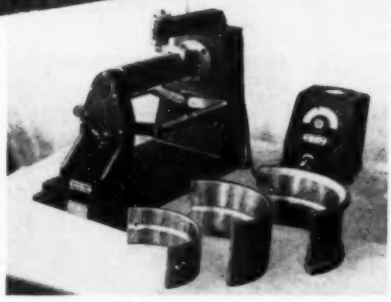
Available in al lstyles and sizes high-speed twist drills and reamers have been added to the present line of Besly taps, abrasive wheels, grinders, and accessories.

*Charles H. Besly Co., 118-124 N. Clinton St., Chicago 6, Ill.*

# Measure Without Mechanical Contact

Checking a tapered part for diameter and runout with a Taft-Peirce Duplex Unit CompAIRator.

## ...with the TAFT-PEIRCE CompAIRator



Checking 8½" diam. Bearing Liners for wall thickness.

Checking Piston Pin Holes for alignment.

**AIR AGE SPEED** • Minute streams of controlled air do the measuring when you use a Taft-Peirce CompAIRator. Neither mechanical contact points nor exact work positioning are required to check a part. As a result, individual measurements can be made with unusual speed—over-all inspection time is reduced drastically.

**NO SKILL REQUIRED** • Since it eliminates the need for human skill and feel, even an unskilled inspector can obtain reliable and exact measurements.

**CONSISTENTLY ACCURATE** • Accuracy is constant and instantaneous. What's more, vibration, shocks, and long extension tubes will not introduce errors—nor will oil deposit or coolant-flow over the work surfaces interfere, when gaging at the machine.

**A MIDGET IN SIZE** • Everything needed, save the gaging members and extension tubes, is in one small cabinet, only 7" wide, 8" high, 7½" deep (Single Dial Unit). Additional filters and regulators are not needed. Write *today!*

**THE TAFT-PEIRCE MANUFACTURING CO.**

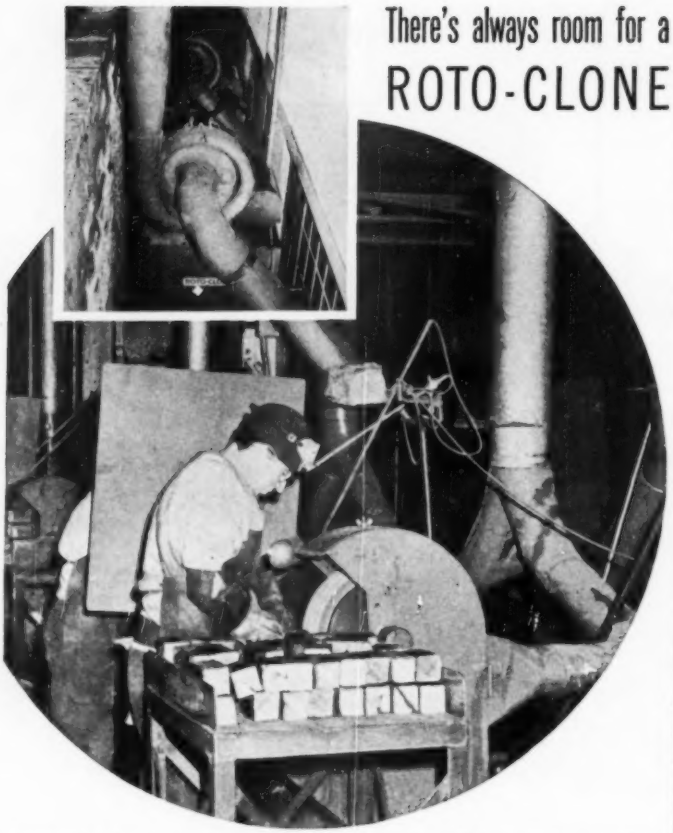
**Woonsocket, Rhode Island**

Please send me further information on the T-P CompAIRator. I would like ( ) Literature, ( ) Information, ( ) Representative to call regarding application to measurement of the parts described in the attached letter.

Name_____ Title_____

Company_____

Street_____ City_____ State_____



There's always room for a

# ROTO-CLONE

WHERE there's a will to practice dust control, there's a way to fit Roto-Clone* into your present production set-up. And here's an installation that proves the point.

This typical grinding department, pictured above, is engaged in snagging forgings—a high dust-producing operation. Space is definitely at a premium, yet the workers enjoy the full benefits of Roto-Clone's positive dust control. Hoods and ducts are all you see. The four Type Dunits, shown above, which serve these grinders are installed in a light well just outside the building—out of the way but always on the job.

The Type D Roto-Clone combines the functions of exhauster and separator in a compact, self-contained unit. All operations—drawing in the dust-laden air, separation of dust, delivery of collected material to storage hopper and expelling the clean air—are performed by one moving part.

And remember—there's always room for a Type D Roto-Clone System. It may be installed as a central type with main duct and branch connections or as individual units serving a single dust-producing operation. For complete information, call your local AAF representative or write direct to—

*Roto-Clone is the trade mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.

**AMERICAN AIR FILTER COMPANY, INC.**
207 Central Ave., Louisville 8, Ky.
*In Canada: Darling Bros., Ltd., Montreal, P.Q.*

AAF
ROTO-CLONE®
DUST CONTROL EQUIPMENT


## Manual Motor Starter Provides Reduced-Voltage Starting

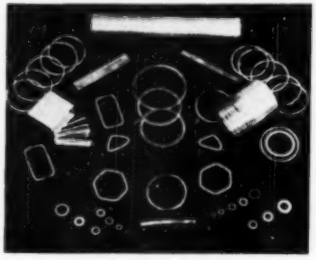
The RMC manually-operated reduced-voltage auto-transformer motor starter can be used with two-phase, three-wire, or three-phase machines where reduced-voltage starting and manual control are desired. This unit provides high starting torque, adjustable voltage taps and voltage and thermal overload protection. These starters range in size to control motors up to 125 hp at 220 volts to 150 hp at 440-550 volts and 15 to 150 hp at 2000-2500 volts.

*Allis-Chalmers Mfg. Co., South 70th St., Milwaukee, Wis.*

## Electrode Welder Stays Cool On ⅛-in. Electrode at 725 Amps

Operating under continuous-duty cycle of 725 amp with ⅛-in. electrodes, the Martin Wells heavy-duty 6S electrode holder is said to remain cool. Silver-brazed cable connections and size 4/0 cable are recommended for use with this holder on 600-700 amp. It is 15 in. in length and weighs 32 oz.

*Martin Wells, Inc., 5886 Compton Ave., Los Angeles 1, Calif.*



## Solder Available in Preformed Shapes

Preformed in rings, pellets, washers, unusual shapes, and sizes to specifications, Kester solder is said to insure uniform results where continuous or repetitive soldering is required. By supplying the same amount of solder and flux on every unit, soldered waste is eliminated and rejects are reduced to a minimum.

*Kester Solder Co., 4201 Wrightwood Ave., Chicago 39, Ill.*

# For ANY METAL...or Any Automatic

## SINCLAIR SUPER-WILKUT

A dependable general purpose cutting oil saves time and money. Sinclair SUPER-WILKUT is highly efficient for all cutting work — *any* metal on *any* type of automatic screw machine. It saves time of machine and operator because changeovers from one grade or type of metal to another can be made *without changing the cutting oil.*

Sinclair SUPER-WILKUT is a sulphurized cutting oil, *but,* unlike the usual sulphurized oils, it can be used with equally satisfactory results on both ferrous and *non*-ferrous metals. SUPER-WILKUT is specially compounded to be *non-staining* and *non-corrosive,* making it particularly suitable for automatics with bronze bearings.

Sinclair SUPER-WILKUT is highly efficient both in dissipating heat from the work piece and, most important, in preventing excessive heat that tends to change dimensions of finished units and cause welding of fine chips to the cutting tool. This is proved by the successful use of SUPER-WILKUT on operations involving cemented carbide tools where recommended water emulsions proved unsatisfactory.

Let SUPER-WILKUT help solve problems in machining operations.

**SINCLAIR INDUSTRIAL OILS**

YOUR NEAREST SUPPLIER OF SINCLAIR PRODUCTS WILL GLADLY ARRANGE FOR LUBRICATION COUNSEL, OR YOU MAY WRITE TO SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

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The Torrington Rotary Swaging Machine uses every bit of stock. With 4000 hammer blows a minute, swaging reduces, sizes, rounds, tapers and points rod, wire and tubing. It makes metal tougher and more resilient. It hammers away minor surface defects.

Torrington Swagers are built to a mechanical perfection based on our 42 years' swaging experience. Send today for your free copy of the illustrated booklet describing the machine and the method.

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Send the coupon today for your free copy of this booklet.

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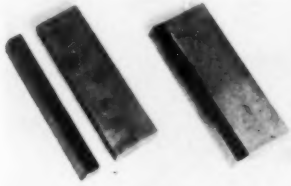
## Round Endless Belts Built Without Splice

To cut down on vibration, U. S. Rubber round endless belts are designed without splice. They are recommended for quarter turn, mule-serpentine cross drives, among other special wheel turning applications. Belts are available in sizes ranging from 3/16 to ½ in. belt diameter and from 6⅞ to 156⅜ in. inside circumferences. Bias cut jackets protect structure and increase flexibility.

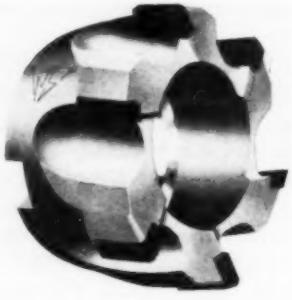
*United States Rubber Co., Rockefeller Center, New York 20, N.Y.*



## Colmonoy Tips Soldered To Centerless Grinder Blades

Silver soldered to present blades, Colmonoy centerless-grinder blade tips are claimed to increase wear life eight times over that of high speed steel. If an entire new blade is required it can be constructed from ordinary mild steel, reducing cost considerably.

*Diamonds and Tools, Inc., 19345 John R. Street, Detroit 3, Mich.*



## Shell End Mill for Higher Feeds and Speeds

Equipped with carbide inserts, the Wendt-Sonis shell end mill is designed for facing or milling to a shoulder at high feeds and speeds. Available in sizes ranging from 1½ to 6 in., these end mills have stress relieved bodies of special heat treated alloy steel constructed to prevent vibration at high speeds.

*Wendt-Sonis Co., Hannibal, Mo.*


**CROSS UNIVERSAL GEAR MACHINES**

*for*

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

**No. 55**

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.

**No. 65**

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

**No. 75**

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.

THE CROSS COMPANY
Established 1898
SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
TURNING • SHAPING • GRINDING • HONING
DETROIT 7, MICHIGAN

*The Camera Doesn't Lie...*

# here's how EATON *Springtites* and *Sems* reduce costs

**Using Eaton Springtites or Sems** frees hands—saves motions—making continuous production possible. Only 3 motions for a complete assembly instead of 8.

**Not using Springtites or Sems** requires many extra motions—causing delay, loss of parts, and reduced production all along the assembly line.

Today, assembly line employees' time runs into money. Where time can be saved and production increased, costs are reduced—overhead spread thinner.

Through the use of Eaton *Springtites* or *Sems* a correctly-engineered unit is assured with a minimum of motions. The intangible savings in paper work, automatically-balanced inventories and elimination of lost parts cuts overhead—saves money.

We can prove what these savings mean to you in dollars and cents. Write for engineering data.

**RELIANCE SPRING LOCK WASHERS** automatically keep bolts, nuts, screws, tight under constant tension—compensate for wear and developed looseness. All sizes and types. Write for Spring Lock Washer bulletin.

**RELIANCE RINGS** — snap, bearing, lock and retainer—form strong shoulders on shafts or in counter bores and on outer races of bearings. Speed production, cut costs—save time and material. Write for engineering bulletin.

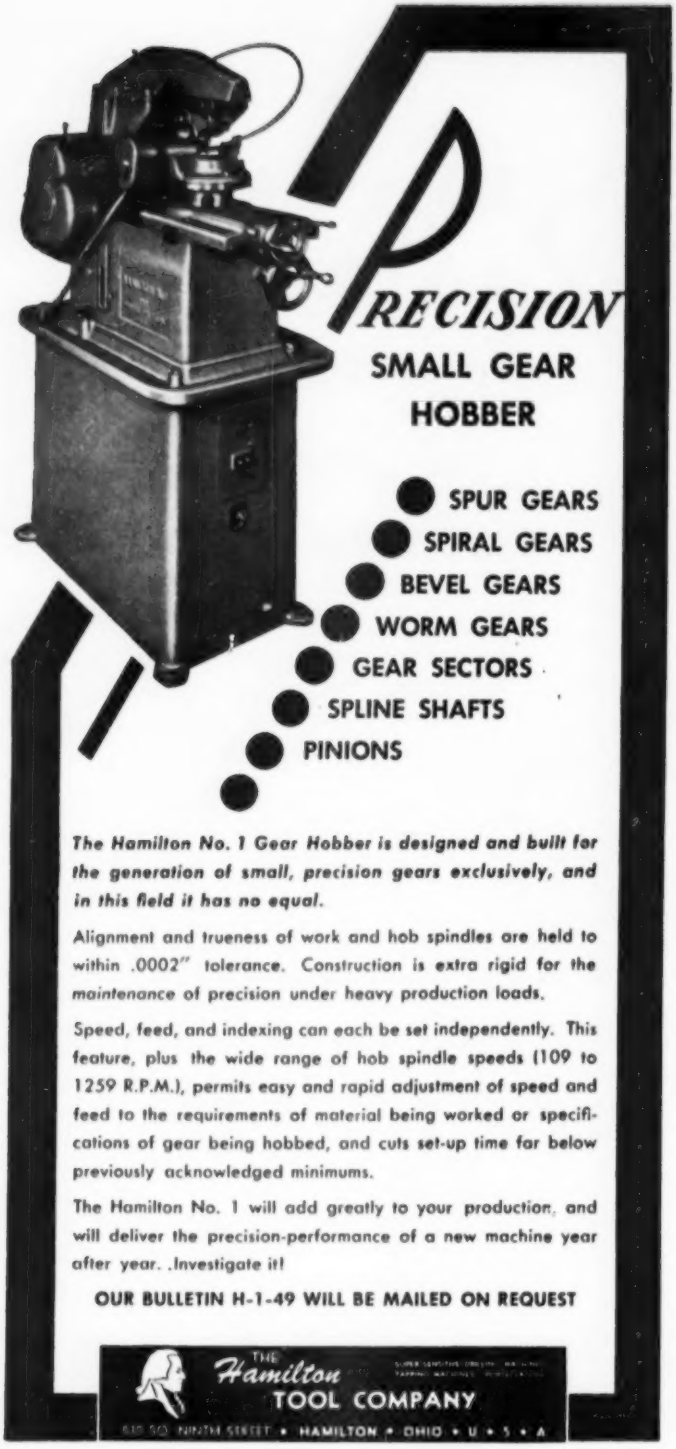
**EATON**

**EATON MANUFACTURING COMPANY**

*Springtites*

**RELIANCE DIVISION, MASSILLON, OHIO**

*Sales Offices:* New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco, Montreal


PRECISION
SMALL GEAR
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The Hamilton No. 1 Gear Hobber is designed and built for the generation of small, precision gears exclusively, and in this field it has no equal.
Alignment and trueness of work and hob spindles are held to within .0002" tolerance. Construction is extra rigid for the maintenance of precision under heavy production loads.
Speed, feed, and indexing can each be set independently. This feature, plus the wide range of hob spindle speeds (109 to 1259 R.P.M.), permits easy and rapid adjustment of speed and feed to the requirements of material being worked or specifications of gear being hobbed, and cuts set-up time far below previously acknowledged minimums.
The Hamilton No. 1 will add greatly to your production, and will deliver the precision-performance of a new machine year after year. .Investigate it!
OUR BULLETIN H-1-49 WILL BE MAILED ON REQUEST
THE Hamilton TOOL COMPANY
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# ROUND TABLE Discussion

## HARD SENSE OR HARD HEAD

Oh, the dignity of poor Ed, and its importance when viewed by a mind which can hardly be other than insignificant! Unfortunately, petty minds are found in all ranks of society and, by the same rule, great minds are not confined to the "upper ten." Once an English duke, long since dead, said

"Let wealth and commerce, laws and learning die,
But leave us still our old nobility."

One could imagine Ed's version to be something like this:

"Let product lag and progress be forgot
So pride be saved and ignorance concealed."

Even, however, as that same old nobility has been sifted and found wanting, so will technical inefficiency fail, especially when cloaked by pride of the sort displayed by Ed. If Henry Ford had had a "Sampson," what would have been his reaction. In a large works run, but not built up, by men with Lilliputian minds, the writer found his fingers were too few to enumerate all the Sampsons who, cramped and confined by their condition, left and became directors or managers of well-known works. The pygmy mind, however, like water, finds its own level, in time, but the firms employing them foot the bill—this being the loss of their more promising juniors. And a foreman's active ignorance can be as damaging as when he lies low and says nothing.

For an experimental product, two pieces were required embodying male and female square threads. The job was put into the tool room but the foreman said he could not do it; he had no lathe with a tangent bar. The machine shop foreman—an Ed—was asked if he could get it done. He did not understand the difficulty but said he could do it. His doing it consisted of giving the job to a man, without instruction or offer of help. There was no tangent bar but by combining the cross feed and lead screw movements, a good job resulted. The works manager was brought along to see it. The foreman, who had given no help and, even then, did not understand how it was done, said to the works manager, "There it is; I told you I could do it." Not a word of appreciation for the man who did it. Not long

# HERE'S A TOUGH MULTIPLE-OPERATION PROBLEM

**PERFORMS 3 OPERATIONS PER CYCLE—**
***Shearing, Riveting and Straightening***
**ON FORGED STEEL PARTS**
***at 35 Cycles per Minute***

*Solved by Elmes!*

For nearly a century, Elmes hydraulic specialists have been solving problems such as this one, brought to Elmes by a prominent manufacturer of farm implements. Each problem in turn has been met with the characteristic ingenuity that built the Elmes Press reputation for excellent performance.

Shearing, riveting and straightening forged steel work— *subject to variations in thickness*—on a single stroke of a press, call for proper application and accurate regulation of pressure. To meet these requirements, Elmes supplied the 100-ton Automatic Openside Press shown above—and turned several troublesome, costly procedures into one smooth, fast, profitable operation. This 3-way operation is being performed unfailingly at speeds up to 35 cycles per minute.

Why not put your pressing problems up to Elmes? Objective engineering, backed by many years of successful hydraulic experience, makes Elmes Presses right for each job. Our staff of specialists is at your service with suggestions, recommendations or cost estimates on existing press designs or new developments—without obligation on your part.

**ELMES 100-TON AUTOMATIC OPENSIDE PRESS**

Moving platen, 18" x 16". 3" stroke. High and low pressure pump provides rapid advance, slower pressing speed and rapid return. Photo-electric safety control stops platen immediately if obstruction breaks light beam at entrance to dies. Accessible, fast, flexible. Sizes and capacities for all service needs.

**DO YOU HAVE THIS ELMES HYDRAULIC METAL-WORKING PRESS BULLETIN?**

Covers single-action, double-action and triple-action presses; standard designs; special applications; automatic feeds. Your Elmes distributor can supply you, or request direct. Ask for Bulletin No. 1010B.

**ELMES ENGINEERING DIVISION OF AMERICAN STEEL FOUNDRIES**

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MECHANIZE material handling—release manpower for production operations—and you cut excess material handling costs—speed production.

Wherever packages, parts, or units are handled—loose or in containers—there is a type of Standard Conveyor (gravity or power, roller, belt, slat, chain, wheel—portable unit) expressly designed to do each particular job best.

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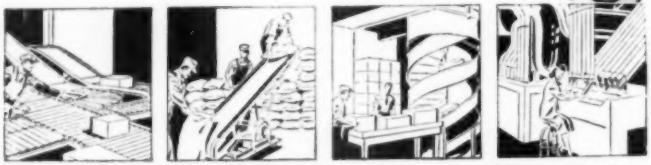

ROLLER · BELT · SLAT · CHAIN CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS


afterwards the man was a works manager—elsewhere, and the foreman was Johnny Walker. But they had lost the brain.

P. E. James
Lincoln, England

•

### TEN O'CLOCK SCHOLAR

WHENEVER the problem of excessive tardiness comes up, too many foremen assume the attitude expressed in the paraphrased proverb, "If the early bird catches the worm, the late bird should catch hell." But censuring or penalizing the errant worker may not solve the problem; it may not prevent tardiness from becoming chronic.

Methods of attacking excessive tardiness should obviously be based on a careful analysis of the incidence of these conditions, and rules of disciplinary action should recognize the wide range of casual factors. Some existing provisions for reducing tardiness are quite arbitrary, providing, for instance, for the loss of a half-hour of pay for tardiness. More alert management, however, tends to avoid such exacting action. It prefers to have the facts before it, for which reason reports of all tardiness are prescribed. Then it may find that appropriate action involves an adjustment of starting time or the provision of adequate transportation facilities, rather than the assessment of a penalty. For repeated offenses, employees may be asked to explain their difficulties to the personnel officer.

Discharge, being the most drastic of all disciplinary measures, is, at the same time, one of the least satisfactory. In many cases it means the loss of the services of an experienced employee whose training and experience have been gained, to some ex-

*"Well! here's a good sign. The sausage slices are .0005" thicker than last week's!"*

# HOW STRESSPROOF CUT COSTS on these 4 products

| | SPLINED SHAFT FOR CLUTCH | WASHING MACHINE GEAR | ADJUSTING SCREW | KING PINS |
|---|---|---|---|---|
| STEEL REPLACED | 4140 | C-1117 CASE-CARBURIZED | ANNEALED A-1335 HEAT TREATED | C-1019 CASE-CARBURIZED |
| OPERATIONS ELIMINATED | FULL HARDENING (@ $1.25 to $3.75 PER SHAFT)<br>STRAIGHTENING | CARBURIZING (@ $140 PER TON)<br>FINAL CLEANUP GRIND | HEAT TREATING<br>STRAIGHTENING | CARBURIZING<br>SECOND PASS IN GRINDING |
| OTHER BENEFITS | REJECTIONS (FORMERLY UP TO 20%) REDUCED TO APPROX. ½ OF 1%<br>MACHINABILITY UP 20% | PRODUCTION INCREASED 100% | PRODUCTION INCREASED 150%<br>REJECTIONS PRACTICALLY ELIMINATED<br>COSTS CUT 33% | TOTAL SAVINGS 25% |

## Provides 4 in 1 IN-THE-BAR QUALITIES

This unique, cold-finished carbon-steel bar cuts costs sharply because it has all four desired qualities *in-the-bar* . . . Strength . . . Machinability . . . Wearability . . . Minimum Warpage. With STRESSPROOF, no heat treating is required—its in-the-bar strength is double that of ordinary cold-finished shafting. Its machinability is 76% of B-1112—fully 50% better than heat-treated alloys of the same hardness. Its resistance to wear as machined is sufficient to replace many heat-treated or carburized steels. Being stress-relieved, it has a minimum of distortion. Investigate STRESSPROOF'S money-saving possibilities. It costs little more than ordinary cold-finished bars. Available in cold-drawn or ground and polished finishes.

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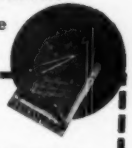

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tent, at company expense. It necessitates the breaking-in of a new worker, usually an expensive process. It would therefore seem that the solution of the problem of the perennial laggard lies in educating the offender to become more efficient in his personal affairs, with management doing its share in eliminating causes beyond the immediate control of the individual.

Investigations of tardiness usually disclose as its most important causes: fatigue, transportation difficulties, housing problems (difficulties in finding homes close to work) and absence of recreational facilities.

The first step in reducing these infractions of punctuality, involves a careful study of the records to discover where and when the problems appear and what types of workers are responsible for them. Only by such careful analysis can offending situations and significant managerial causes of disciplinary problems be discovered.

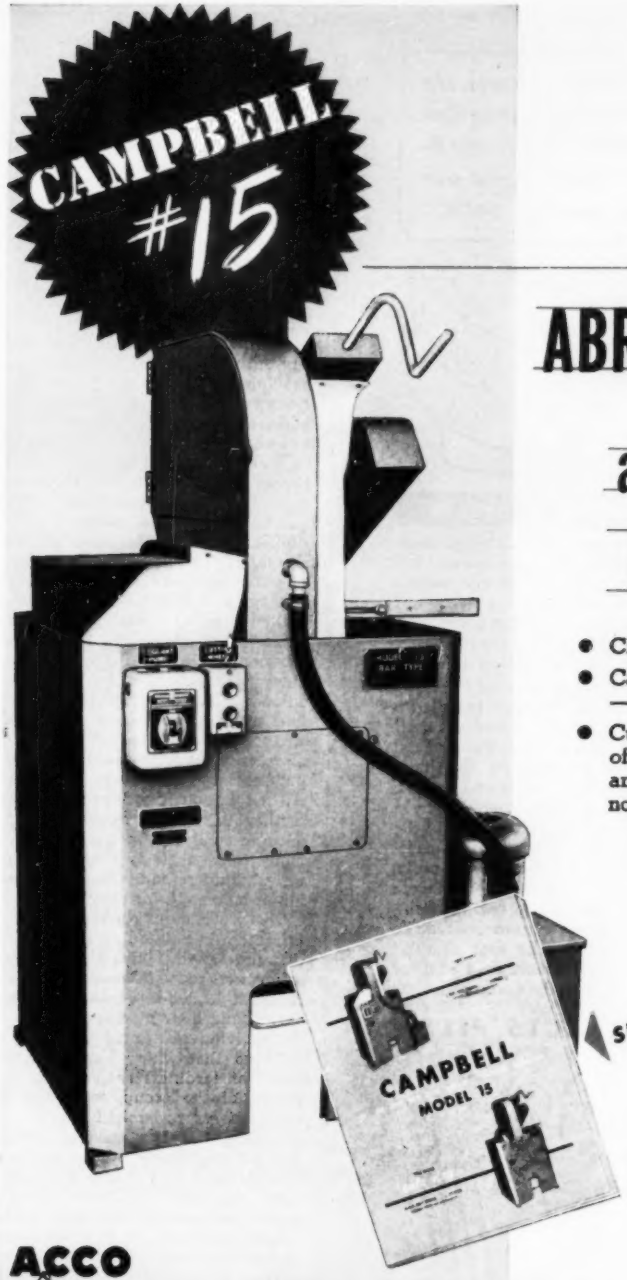
One reasonable question in this connection concerns the length of service of the worker. In order to evaluate data secured in answer to that question, individual disciplinary experience may be correlated with length of service. Such comparisons will indicate whether experience in the organization instills habits of observance or of violation, so far as rules are concerned, and it may prove effective in suggesting the need for changing methods of training.

Many other personal characteristics of employees may be found to be significant in explaining disciplinary problems of this type. For this reason, comparisons may profitably regard differences in tardiness rates for different age groups (older workers generally show lower tardiness rates) and for the sexes (women generally have higher tardiness rates). In order that such comparisons may have maximum value, it is essential that careful records of tardiness be maintained.

What is really important is that tardiness reports shall be uniform, inclusive, and regularly made. These reports can form the essential basis for disciplinary action by providing a thorough understanding of the situations in which the various tardiness problems arise. Such an understanding is an elementary essential in determining appropriate action for eliminating the causes of excessive tardiness. Only when disciplinary action is based on such understanding may it be expected to achieve the desired results.

In dealing with chronic offenders, several courses of action are open.

CAMPBELL #15

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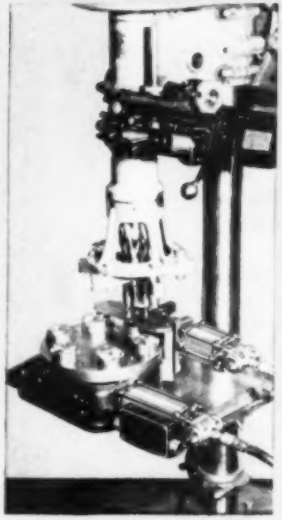

HERE'S HOW

"We had been drilling these holes one at a time on hand-fed drill presses. The run wasn't long enough to warrant expensive drilling equipment but was too long for the costly way we were doing it.

"At the suggestion of a Bellows Field Engineer we installed a Bellows Feed to feed the drill spindle, a Bellows Rotary Feed Table to position the parts under the spindle and a work holding unit powered by a Bellows Air Motor to hold the part in position. The drill press feed, the work feed table, and the clamping unit were synchronized to work continuously and automatically. The savings on the first month's production more than paid for the cost of the entire unit."

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AKRON, OHIO


When a case is thoroughly understood, the offender may be interviewed by a representative of management, or it may be found more effective to have such cases handled by committees made up of employees. In any case, punitive action should always be regarded as of secondary importance, and primary emphasis should be placed on effecting a readjustment in the attitudes of the employee, to the end that his future behavior may be voluntarily cooperative.

Experience with provisions of rewards and penalties as means of solving the problem of tardiness, has resulted in current managerial opinion being divided on the desirability of providing automatic rewards or penalties in connection with disciplinary policies relative to attendance. Many firms have long followed a procedure in which minor infractions, if they exceed certain limits, automatically result in fines, pay reduction or docking, loss of vacation rights, or other similar penalties. All such devices are highly effective with certain types of employees and quite unsatisfactory, if not actually dangerous, with others. For the latter, such penalties tend to develop feelings of resentment and dissatisfaction, since in many cases the worker feels that automatic iron-clad rules operate unfairly and do not take individual circumstances into account. Furthermore, it is entirely possible that employees may be so extensively penalized that no incentive for avoiding further infractions remains. Thus, once an employee has been tardy so many times as to lose his vacation rights, what reason is there remaining as he sees it, for punctuality?

The provision of rewards for non-infraction is but the positive aspect of a practice in which penalties are a negative phase. Common practice frequently makes use of such rewards, and their most usual form is the individual or group bonus. It is believed that where individual absence or tardiness reduces the efficiency of the group, some sort of collective reward might operate effectively. However, several studies seeking to evaluate the use of these devices have been made. While few firms that have tried such arrangements have later discarded them, serious questions as to their value and effectiveness, if not their actual propriety, are raised. One school of thought on the subject questions the reasonableness of paying workers for doing exactly what, in their own best interests and those of fellow-employees, they should expect to do. Furthermore, there is real question as to whether arrangements provid-

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ing rewards, like those which provide penalties, may not have effects quite opposed to those intended, since, as soon as any employee has become disqualified, the incentive to avoid infractions is completely removed as far as the bonus is concerned.

Rules of good shop conduct, which include punctuality, by means of which cooperation is made possible, make each worker more efficient, but some workers frequently seek privilege and suspension of the rules respecting punctuality as far as they as individuals are concerned, because of some convenient excuse. In many cases, employees lose sight of the purpose of disciplinary regulations and their relationship to the welfare of individual employees. Being a good employee involves two-way loyalty. Observance of shop rules relating to punctuality not only benefits the individual but it raises the group efficiency and gets jobs done on time. As Thomas Jefferson once stated "No person will have occasion to complain of the want of time who never loses any."

Harry Kaufman
Philadelphia, Pa

•

THE worker who makes a habit of always arriving late in the morning is a really serious problem; some form of disciplinary action must be taken or the consequences are likely to be serious.

In my own experience as an itinerant machinist I have found that shops could be classified as the "Come when you're ready" or "Be prompt, or else" types. I have also witnessed the transition of a shop from the latter to the former category.

In some shops it is just not the custom to be late, and any offender usually finds it so embarrassing to enter such a shop after starting time that he prefers to start after the midday break and plead sickness as an excuse for his absence during the morning. It is all a matter of internal morale and this can be promoted by good supervision. The mere presence of a steely-eyed executive in a shop five minutes before work starts every morning can stiffen internal discipline.

Being late is purely a matter of habit, like being early. If the internal discipline of a firm has slackened so that the employee feels that it doesn't matter if he arrives a half hour late occasionally, he will eventually arrive a half hour late every morning. One interesting point about habitual latecomers is that they arrive at the same time every day, plus

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or minus a very few minutes. This shows that they have got the habit of taking a later bus or train when they should be taking an earlier one.

A late arriver who has got into a groove can start a chain reaction in a "Be prompt, or else" type of firm. Before you know it, the established starting time has gone up the spout and half the staff begin drifting in at any old time. This has got to be stopped before it starts and no matter how important the laggard is to the firm, some action must be taken.

Disciplinary action can take two forms, both of which deprive the slow coach of his earning power. The first stage is to send him home for the day. This is known as suspension, he makes the journey to and from the plant and loses a day's pay and it should give him a jolt. If this makes no impression, then suspension can be extended to a week. If he wants his job, then he will arrive at the plant after his enforced idleness a sadder and wiser man. If he never comes back, then you are well rid of him. If he returns and takes up the old routine, fire him.

It is drastic treatment, but the laggard is suffering from a disease requiring a drastic remedy. His effect on other people in the shop is likely to be infectious and no matter how indispensable he is as a workman the risks involved in keeping him are too heavy to bear.

F. E. Riley
London, England

•

It will be obvious that Mullins is setting a bad example. He appears to be a fellow that goes out with the boys several times a week, gets home late, and of course he still likes to sleep. So, he stays in bed when he should be producing.

This type of man gets a kick out of it when he arrives an hour or two late, and he will never change as long as Ed tolerates it. It is certainly poor supervision to allow it to continue.

Here is one suggestion that really worked on a similar case: We had a chap like Mullins, and talking to him did no good. So the next time he was late we put another man on his machine till Smith showed up. When he arrived he was obviously put out when he found another man running his job, and he protested to the boss who, in turn, informed him that work schedules have to be rigidly adhered to and whenever he was late someone else would be on his machine. This policy continued for about two months, and then Wood, the fellow who had been losing time, finally dropped the habit, and be-

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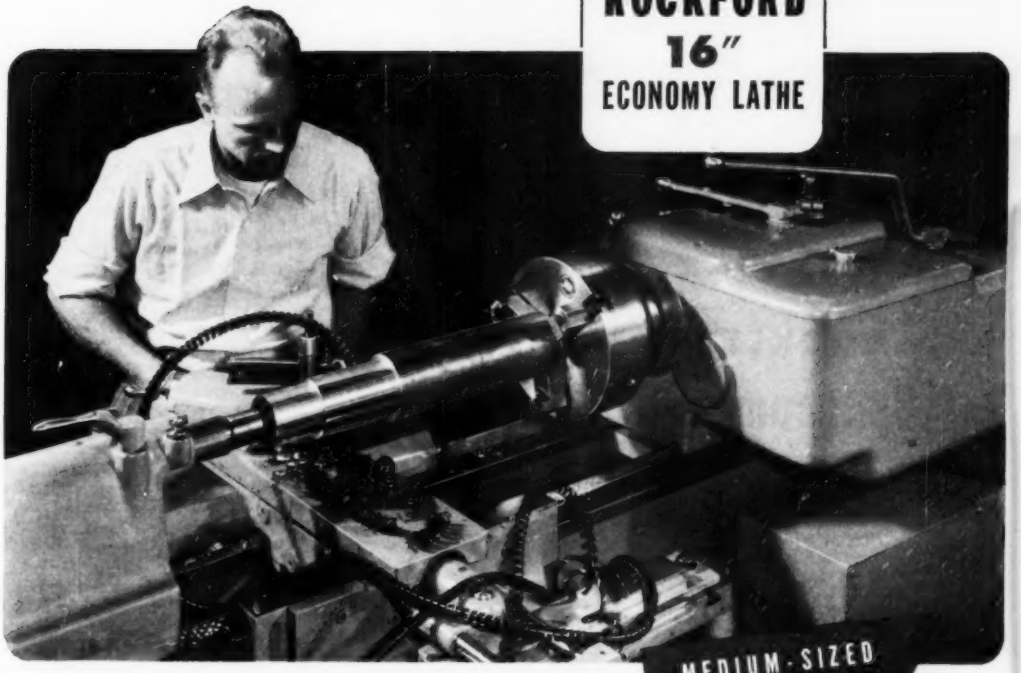

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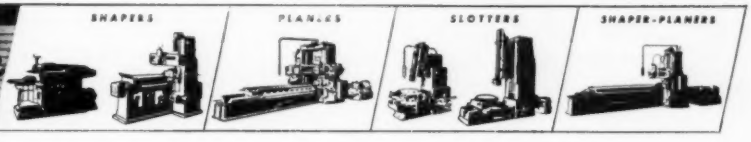

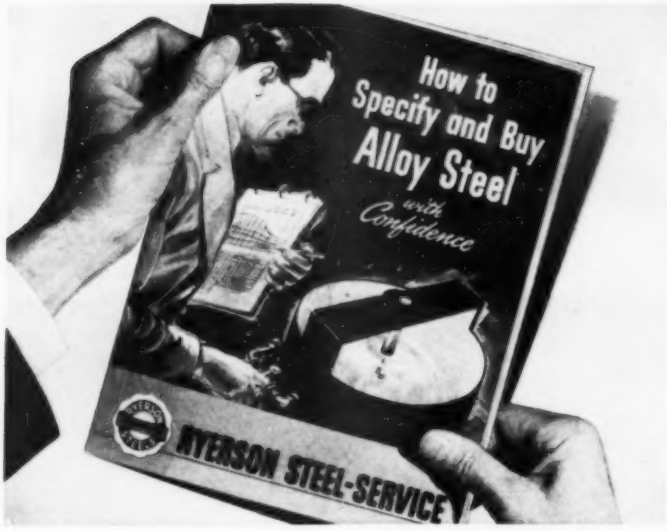


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came a punctual, dependable employee.

There are times when more drastic measures are necessary: Many years ago when work started at 6 AM we had a chap who was a sort of straw boss and was responsible for setting up tools on six automatic machines. He was also a crackerjack workman, thoroughly satisfactory in every way with this exception: He drank pretty heavily and started coming on at 9 AM several mornings a week. He earned top wages in the plant, had a family, but he never had any money. After weekends he would borrow from anyone who would lend. Talking did no good. We did not want to let him go, so we started breaking in another man on his job, working along with him. But this had no effect, so it was decided to let him go. He was no better off working than not working. Also these six machines produced an important part of our output, and when not functioning properly completely upset our schedules.

About a month later, around 6 PM, the shop was working overtime. The straw boss who had lost his job came around to the back gate and asked to see the boss. He was forlorn and really looked as if he had become a tramp. He had come to beg his job back, and stated that if taken back he would never lose time, would go on the wagon, and so forth.

We were just as glad to have him back as he was to come back, although of course we did not tell him so.

Anyway, letting that fellow out for losing time turned out to be highly satisfactory all around. He straightened himself out and became a valuable employee. It was drastic, but it worked.

You know that in probably 99%

*"Just forget about the dolly I asked you to get and c'mere!"*

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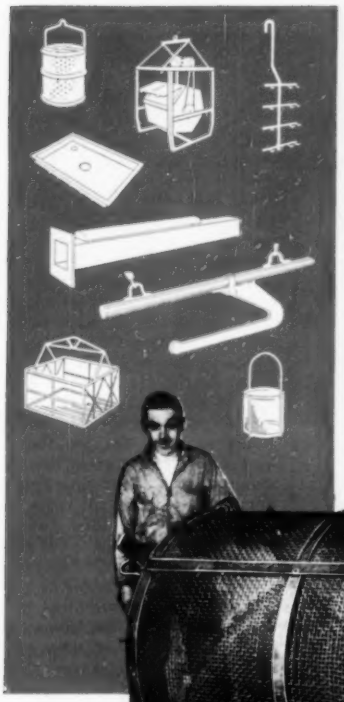

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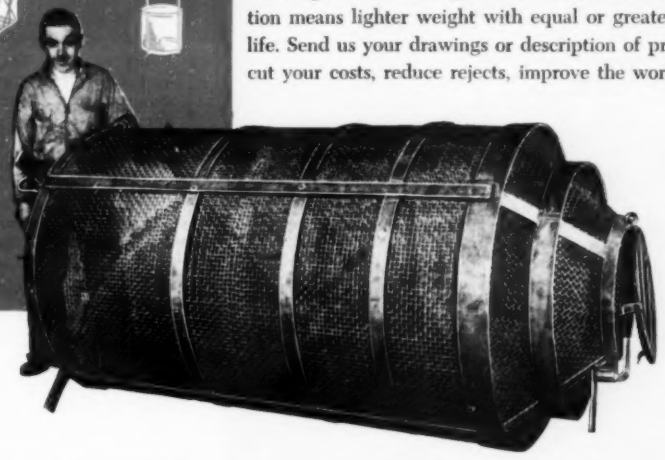

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of cases where a new employee starts on a new job no time is lost at all in the first month, and then one morning some employee doesn't show up till late. And if the boss doesn't mention it, it happens again and becomes a habit. I am under the impression that no one ought to lose any time, except when ill or for special reasons, with the short 40-hour week prevailing, and so I believe that all employees should be expected to be 100% good timekeepers.

Arthur Silvester
Niantic, Conn.

•

### THE ITCH TO TRAVEL

Men are so different in character and have so many different goals in life that what Al says about Hamilton may not be right at all, although it may fit somebody else.

Very few men in shops really know exactly what to do to promote their own interests. Some think they must move from place to place to gain experience and recognition, while others stay at one place expecting the same result. This attitude might not have been their original point of view. It has perhaps developed at the place where they once worked. Some companies take care of their efficient men, while others pay no attention at all to the working force.

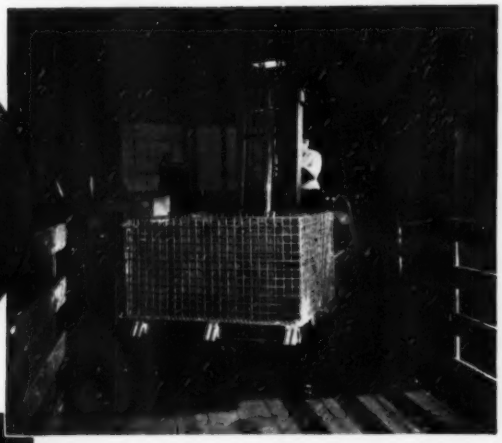
If people at large understood how detrimental it is to our standard of living to leave the job they have gained proficiency in, or how expensive it is to break in new help, they would probably think twice before they left. On the other hand, freedom to choose your own place of work is one of the fundamental favors of democracy.

A man's age also enters into the discussion when he gives up his job. The young man who wants to advance and really knows that it is only through hard work he may gain his goal will probably stay at one place and perhaps use his spare time to improve his education, after which time he will leave if he does not get his chance. If, on the other hand, we have another young man before us of the type that advancements come by chance rather than by ability, he will shift from one place to another without knowing what to do to move forward. He is like the rolling stone that never settles down, and he will soon be old and continue his restlessness. Such men should not be rehired because they will continue to move back and forth.

I think, however, that both Al and

# Pittsburgh CARGOTAINERS

## Speed Operations and Reduce Handling Costs



*Above,* CARGOTAINER being loaded into delivery truck at vendors holds 345 castings—more than 2700 lbs. Previously only 88 castings weighing 704 lbs. were handled in odd size drums by one man in the same amount of time. Uniform size of CARGOTAINERS allows easy stacking after castings are loaded—also affords more efficient handling from inspection through shipping.

CARGOTAINERS in above photograph are received at assembly plant from vendor—are easily unloaded directly from truck to storage space. Note ease of stacking and minimum of storage space required, also the variety of parts that pack easily in CARGOTAINERS.

*At right,* CARGOTAINERS again save additional handling time and costs at end of machining process on castings. Parts are easily packed back into CARGOTAINERS and moved to storage to await final assembly. The awkward gap between vendor and assembly plant is easily bridged with versatile, maneuverable CARGOTAINERS.

For further information on Pittsburgh CARGOTAINERS, write Pittsburgh Steel Products Company, Department AM, Grant Building, Pittsburgh 30, Pa.

CARGOTAINERS illustrated are in operation at both Pittsburgh DuBois Division and Monessen Foundry Division, Rockwell Manufacturing Company.

**CARGOTAINERS** by **Pittsburgh Steel Products Company**
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Ed must analyze many aspects in different people's lives, if they want to get proper answers to their questions. Hamilton is likely to be as good a worker as before he was rehired. He might have learned a lesson while being away. Everybody ought to get at least two chances. Perhaps his foreman has also learned some favorable things about him while he was away. Even if a man is fired, I recommend for my part that he be given two chances. It is not always the man's fault that he feels it is best to quit. And I think executives can do a lot to keep restless men from leaving simply by following up each man's desires and aims in life with a view of helping them along. In a heart to heart talk they can advise their men what to do. Rehiring a man might be the turning point at which he realizes he gains nothing by moving about.

A. E. Fristedt
Stockholm, Sweden

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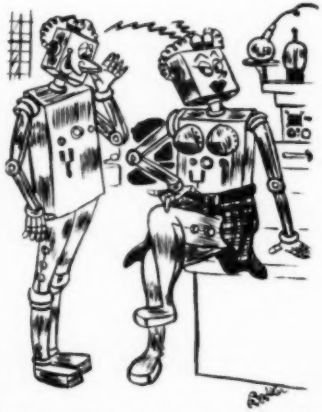
### CORRECTION

In the article entitled, "Math Cuts Cost of Machining Studies," by Dr. M. Kronenberg in Sept. 22 A.M., the following corrections should be made on p 105, the number (7) should follow the sentence, "exponent of temperature $\theta$ vanishes when: $-c-d+1=0$;" on p 105, the second line in the right-hand column should read, "in the same way from equation (2) . . . ;" on p 106, equation (12) should read

$$t = \frac{k \cdot p \cdot v^{2n} \cdot A^{n} \cdot h^{2n-1}}{\lambda^{2n}} \quad (12)$$



*"Ahem, Elizabeth, your bolts are showing!"*

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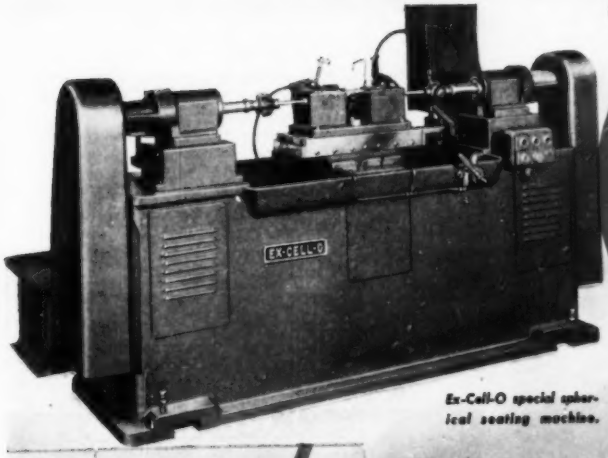
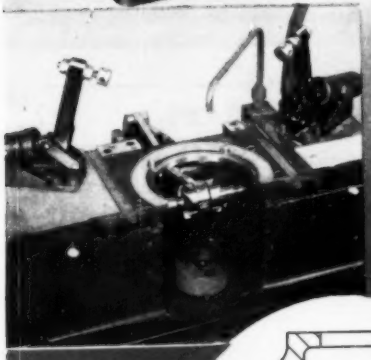
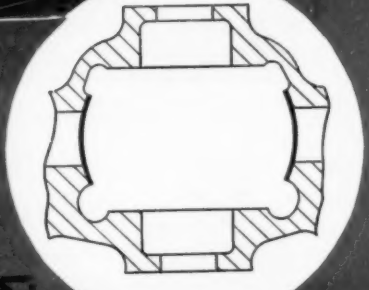



*Ex-Cell-O special spherical seating machine.*



*Left: View of work fixture and cutter on Ex-Cell-O special spherical seating machine.*

*Right: Heavy lines show operation performed on differential cases with Ex-Cell-O special machine.*



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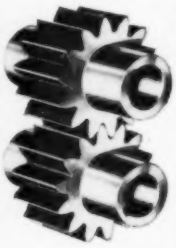

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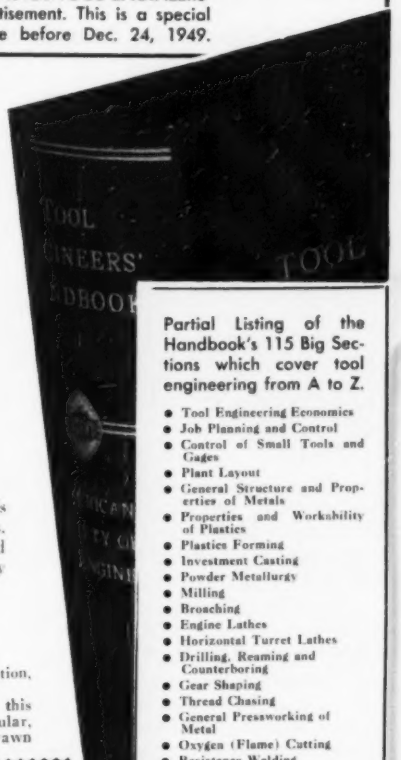

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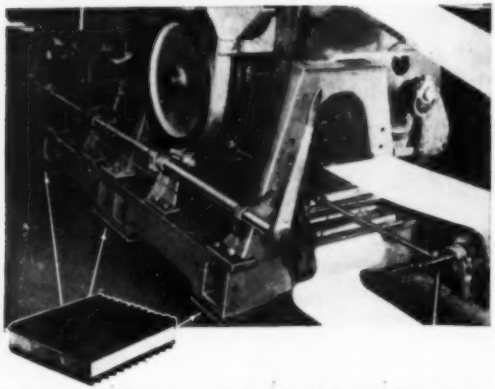

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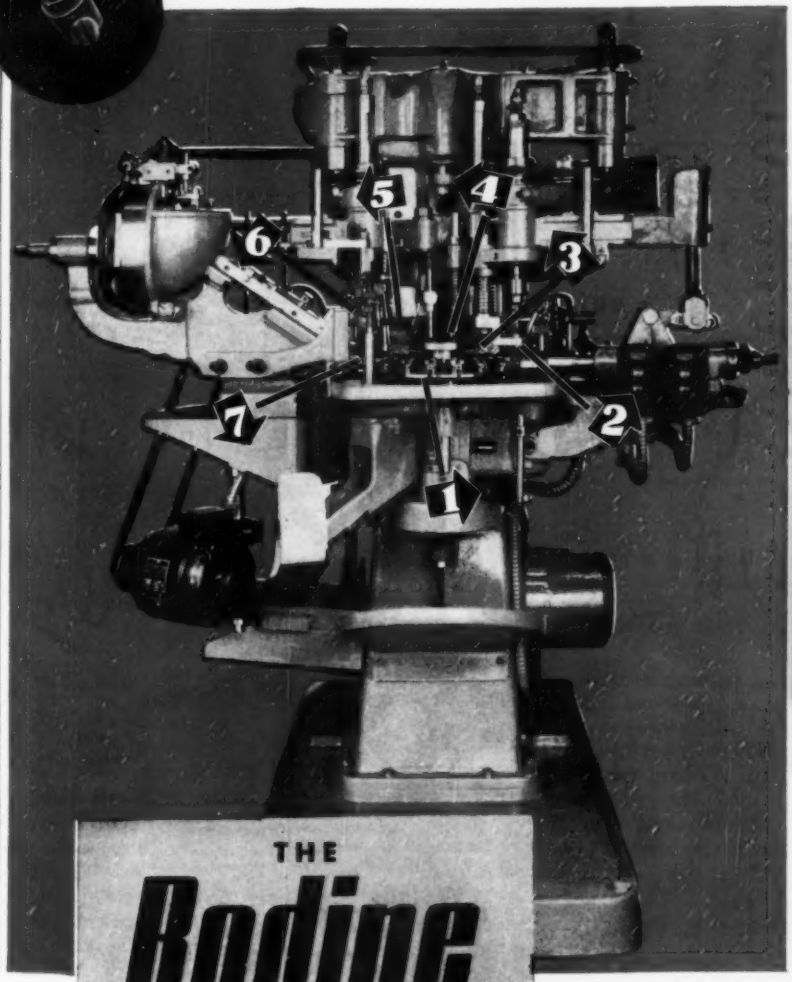


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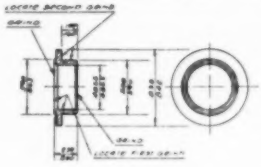

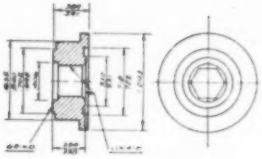

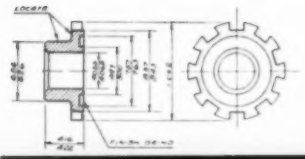

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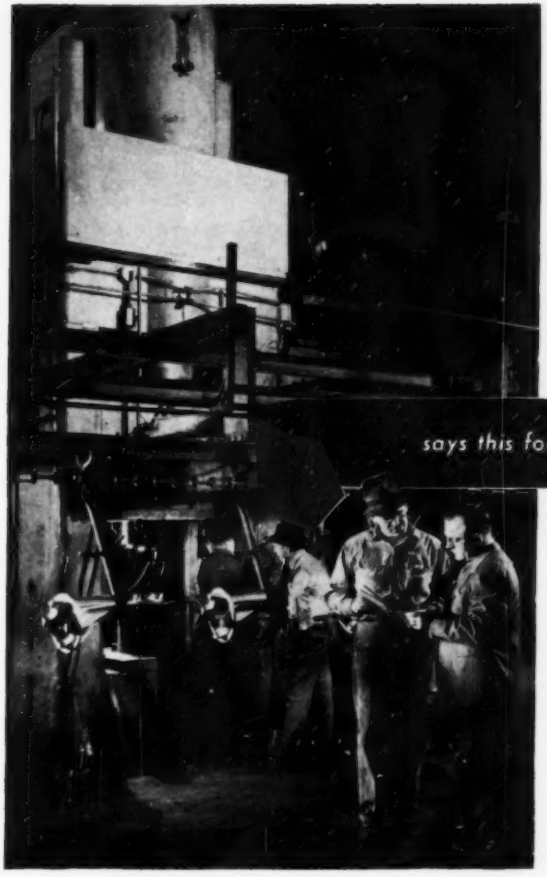

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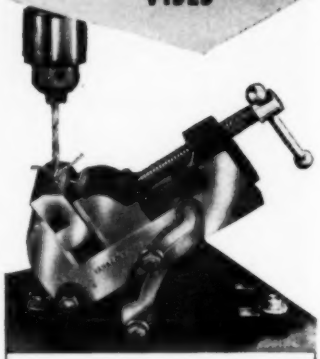

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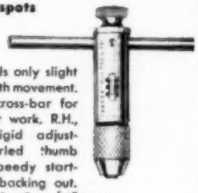

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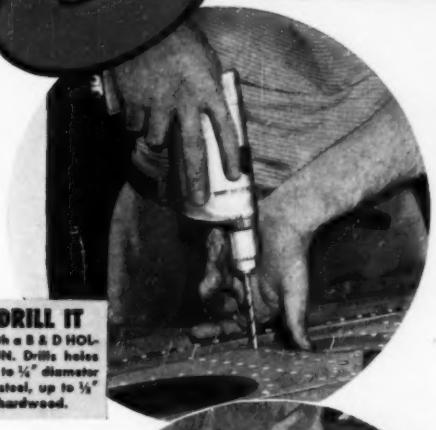

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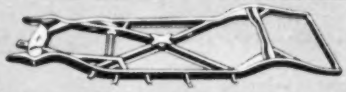

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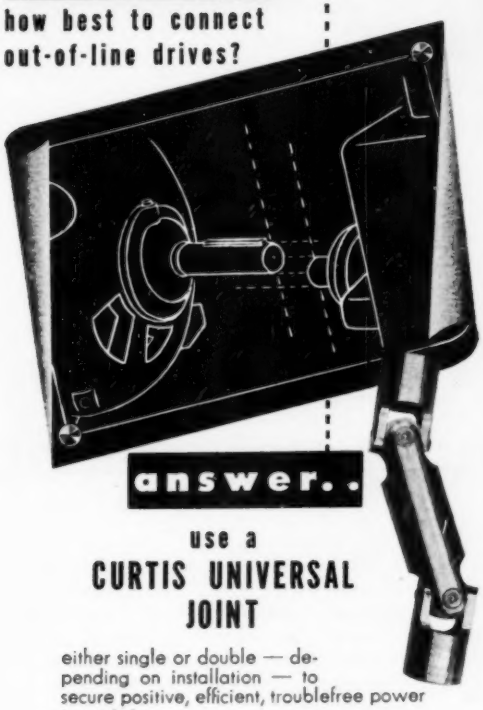

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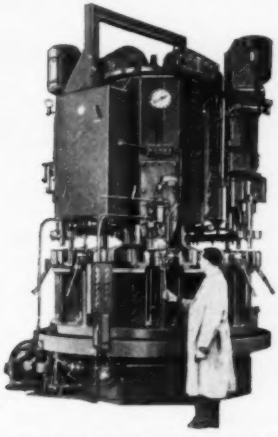

This type VSI vertical indexing drilling machine is designed for drilling, reaming and chamfering five bolt holes and drilling and chamfering one 18″ hole in automotive rear axle.

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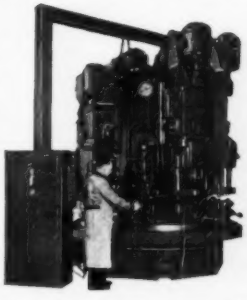

This type VSI special vertical automatic indexing machine is provided with eight two station fixtures for holding one each right and left hand spindle assembly supports. Operations include drilling, reaming, chamfering and sawing. While each head is hydraulically actuated, on the machine illustrated, electrical mechanical heads are also available.

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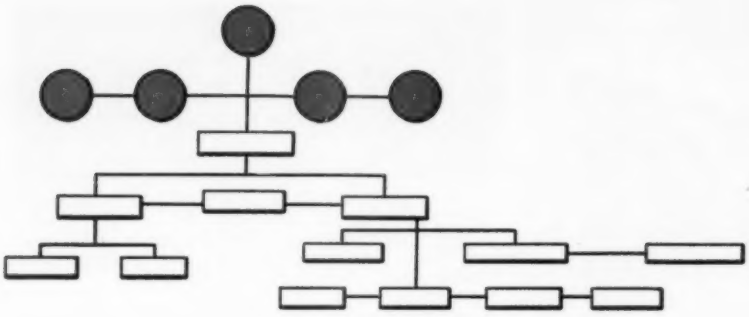

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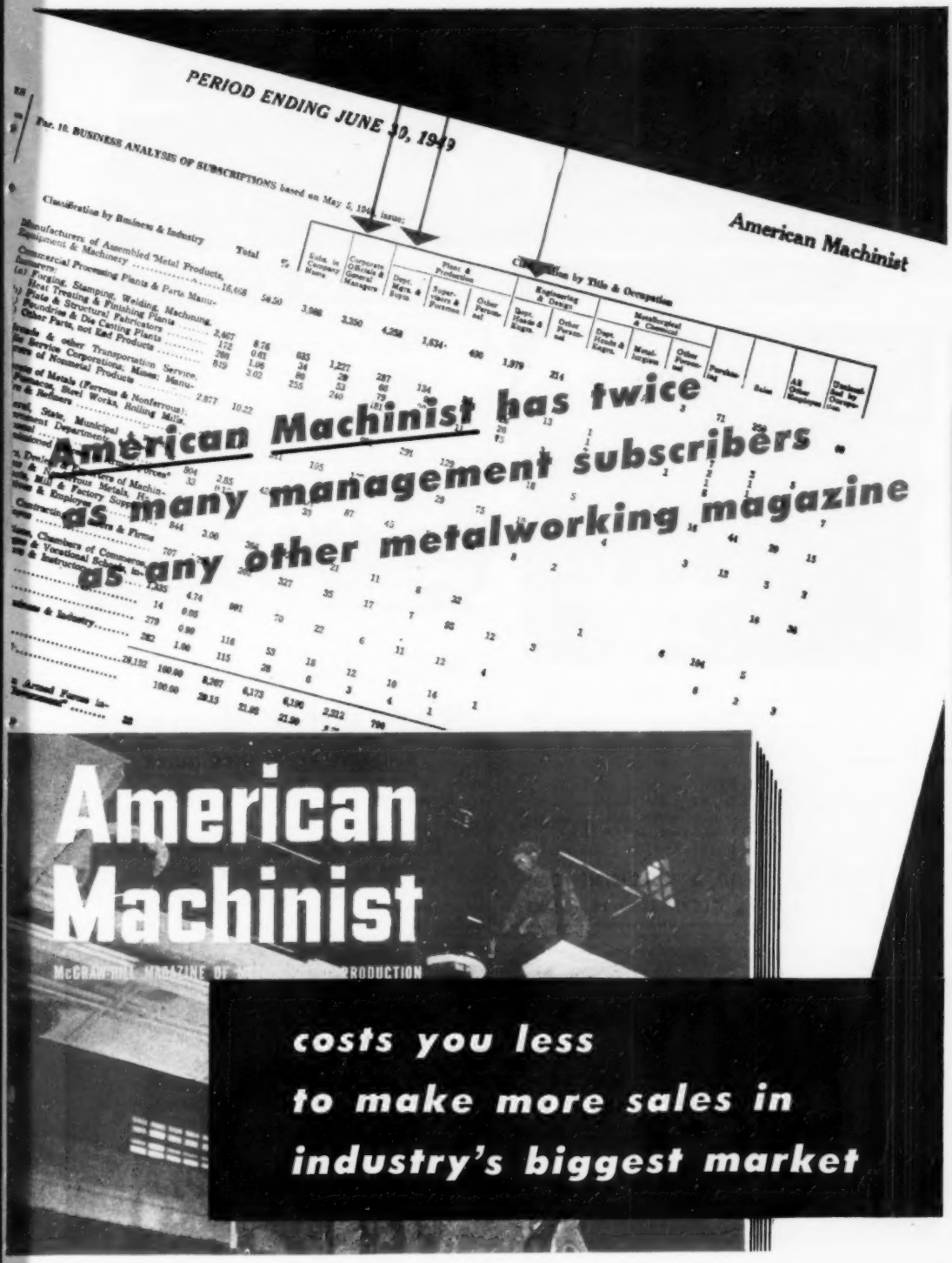
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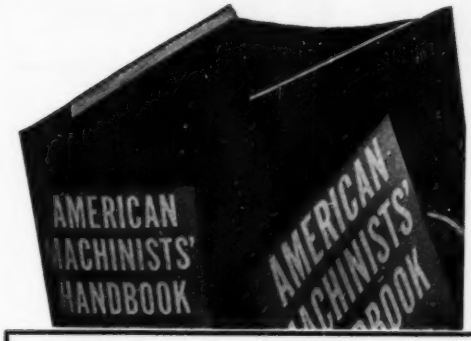


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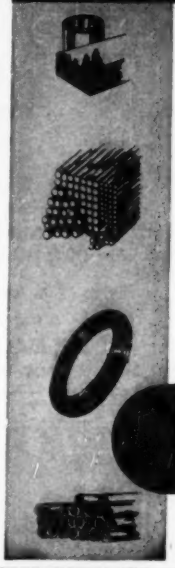

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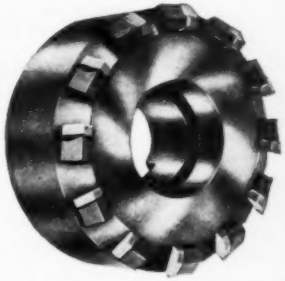

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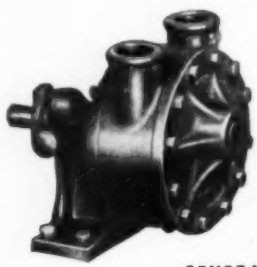

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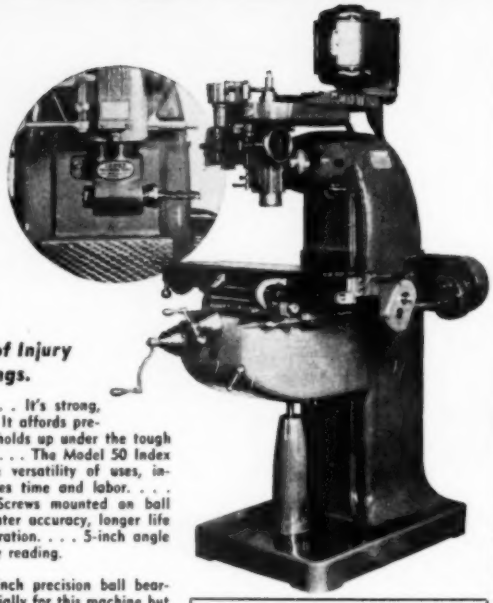

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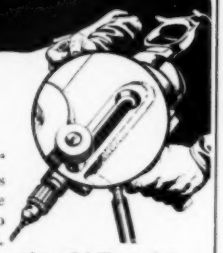

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operates from 1/4" to 5/8" in steel: 1/4" to 1 1/4" in wood.

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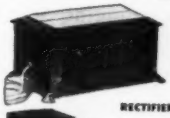

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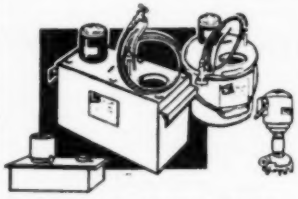

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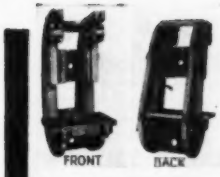


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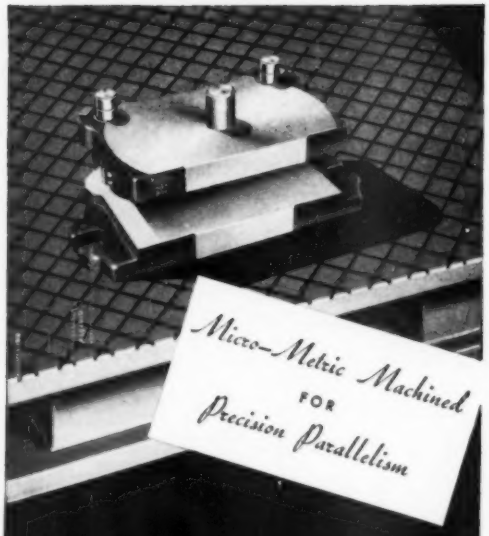


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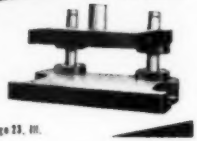

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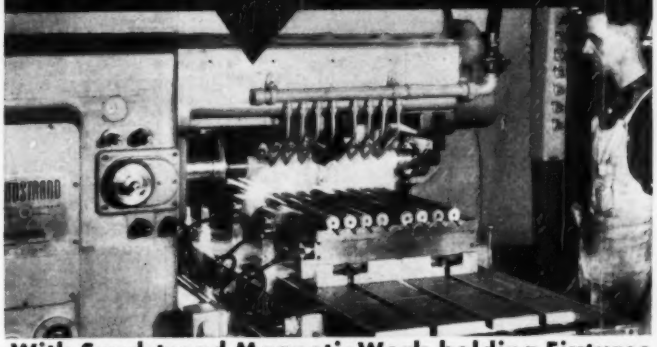

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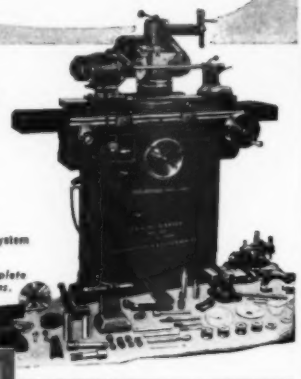

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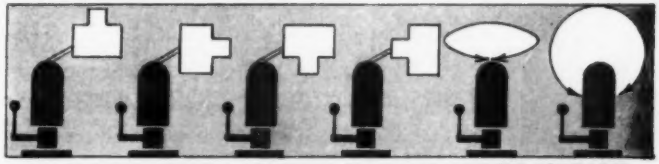

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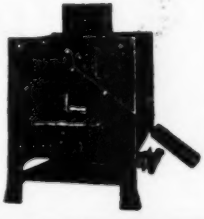

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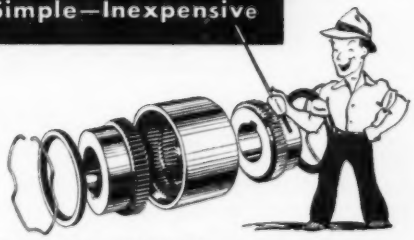

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*Overhang Sub-Press*

**WALTHAM MACHINE WORKS**
HIGH STREET, WALTHAM, MASS.

WALTHAM

---

**ACCURACY**

***Efficiency***

**Economy**

These three factors are the key-note of our special tools and machinery. Columbus Die-Tool builds and designs the tool for your particular purpose and will solve the toughest tooling problems effectively and promptly. Do not hestitate to consult us, our experience in this field is most comprehensive.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES

**COLUMBUS DIE-TOOL and Machine Co.**
935 CLEVELAND AVE.
COLUMBUS 1 OHIO
ESTABLISHED 1904

---

*Famous for*

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

H&G DIE HEAD

See our Advt. on Page 39 Feb. 10 '49 American Machinist

THE EASTERN MACHINE SCREW CORP., 29-49 Barclay St., New Haven, Conn.
Pacific Coast Representative: *A. C. Behringer, 554 N. San Pedro St., Los Angeles California.* Canada: *F. F. Barber Machinery Co., Toronto, Canada.*

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**Only Reliable Products Can Be Continuously Advertised**

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**GRANT**

RIVETERS — PIONEERS in their line—head rivets from smallest to 3/4" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

*Write for literature and don't forget to send samples.*

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

# SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

**UNDISPLAYED RATE**

*(Not available for equipment advertising)*

**90¢ per line, minimum 4 lines. To figure advance payment count 5 average words as a line.**

**POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.**

**PROPOSALS, 90 cents a line an insertion.**

**INFORMATION**

**BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 1 line additional in undisplayed ads.**

**DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).**

**DISPLAYED RATE**

**The advertising rate is $9.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.**

**AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.**

*NEW ADVERTISING received by 10 A. M. November 29 will appear in the issue of December 15 subject to limitation of space available*

*REPLIES (Box No.):*
*Address to office nearest you*
*NEW YORK: 330 W. 42nd St. (18)*
*CHICAGO: 520 N. Michigan Ave. (11)*
*SAN FRANCISCO: 68 Post St. (4)*

## EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service. 39 years recognised standing and reputation. The procedure of highest ethical standards in individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

## POSITIONS WANTED

COST REDUCTION Engineer with years of experience on manufacturing methods, tooling, plant layout, design improvements and production engineering. Past five years on cost reduction work. Desires connection with reliable concern. PW-1292, American Machinist.

ENGINEER, M.E., with machinist background. In charge of large shop and related functions, 16 years. Development and construction of special production machinery. Locate anywhere. Available on short notice. PW-1380, American Machinist.

SALES ENGINEER: established in eastern territories. Background ME, manufacturing and tooling in mass production industries. PW-1447, American Machinist.

## SELLING OPPORTUNITIES WANTED

CONSULTING SALES Engineer: 10 years successful experience in light and heavy machinery now available. Age 35: Resume furnished. SA-1354, American Machinist.

AN ALERT, aggressive young salesman, with car, is interested in handling a good line Northern New Jersey and Rockland County, New York. If you want thorough, efficient coverage of this territory, write SA-1434, American Machinist.

MANUFACTURERS AGENT. Additional lines wanted for eastern mass-production companies. Background as chief engineer, includes high speed precision tooling. RA-1446, American Machinist.

SALES ENGINEER, heavy machine tools and equipment, 18 years industrial engineering experiences, contacts with key executives New England states, prefers exclusive representation responsible items. SA-1467, American Machinist.

## CONTRACT WORK

**Bicycle Manufacturing Company**

in Germany with modern production plant and equipment is willing to add to the production program a suitable, and, if possible, patented article. Please send offer to CW-1460, American Machinist.

## PATENT ATTORNEY

**Patent Practice**

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel. Registered Patent Attorneys. Suite 453, 815-15th Street, N. W., Washington 5, D. C.

*Don't forget the*

**BOX NUMBER**

When answering the classified advertisements in this magazine, don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

## MECHANICAL DESIGNER

Large, well-established mid-western tool manufacturer is seeking an *experienced* machine designer (*not a draftsman*) familiar with hydraulic and electronic motions. Position is permanent and offers a splendid opportunity for a graduate engineer who can not only design his own machines but also develop the designs of others.

*Please apply by letter giving full information on education, experience, references and compensation.*

**P-1378, AMERICAN MACHINIST**
**330 W. 42nd St., New York 18, N. Y.**

## EXECUTIVES INTERESTED IN CHANGING POSITIONS

Make use of our continuous nationwide contacts. We offer a unique, confidential & discreet service to Executives desiring to contact employers Write for details.

**MUTUAL POSITIONS PLAN ASSOCIATION**
**55 William St., New York 5, N. Y.**
(A Mutual, Non-Profit Membership Organization.)

## WANTED

## WANTED

**SURPLUS ABRASIVES**
**SHEETS—ROLLS—BELTS**
IN
Aluminum Oxide—Silicon Carbide
Garnet — Emery — Flint
*Must Be in Perfect Condition*

**ROYALE ABRASIVE COMPANY**
**2272 Logan Blvd., Chicago 47, Ill.**

## WANTED

**36"x12' Gray Open Side planer. Must be modern and in First class condition.**

**18"x80" Centers Heavy Duty Engine Lathe.**

**WHALEY ENGINEERING CORP.**
**P.O. Box 1336 Norfolk 1, Va.**

## WANTED

1 Electric Induction Furnace, capable of melting 10 lb. Stainless Steel.

**HAYDEN MACHINERY**
**WALLINGFORD, CONN.**

## GENERAL MANAGER'S ASSISTANT

Educated in engineering and business administration. Broad experience background in company administration, production, sales. Have assumed full responsibility in absence of firm's head. Seek connection to use this ability and experience.

**PW-1464, AMERICAN MACHINIST**
**330 W. 42 St., New York 18, N. Y.**

## MANUFACTURING EXECUTIVE

Broad successful industrial experience directing and coordinating all Manufacturing, Purchasing, Planning, Engineering and Production. Aggressive, cost minded, resourceful. Excellent references.

**PW-1314 AMERICAN MACHINIST**
**520 N. Michigan Ave., Chicago 11, Ill.**

SALES ENGINEER, M.I.T. '41, who has successfully introduced two new lines of production machine tools to the automotive industry since the war, can now devote all his time to one additional line.

**RA-9976, AMERICAN MACHINIST**
**520 N. Michigan Ave., Chicago 11, Ill.**

## CONTRACT WORK

***Small or large orders wanted for***

**PRECISION METAL PARTS**

**by well equipped machine shop with Low Overhead**

- **Bar work to 2½". Chucking work to 12". Precision work to Navy tolerances. Complete tool room; bench facilities; turret and engine lathes; millers; oil grooves; welding; skilled labor. Can assist in design or modification of product for lower cost or mass production. Engineering cooperation at your service.**

***FRANCIS*** *Metal Products Corporation*
**P. O. Box 155 PALMYRA, N. Y.**

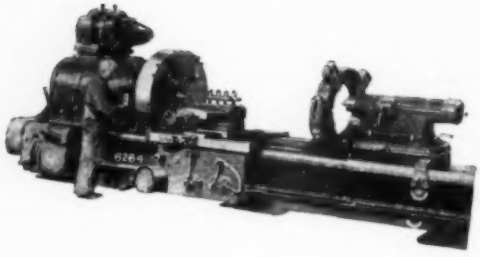
## PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them

**GENERAL PATTERN WORKS**
2233 Buck Street Cincinnati, Ohio

# SIMMONS BEST BUYS

## SEE THIS WICKES LATHE TODAY!



42" x 78" Centers Wickes Heavy Geared Head Screw Cutting Engine Lathe. 16-geared spindle speeds. Forged heat treated head and tailstock spindles. Power Rapid Traverse, Apron Control with Stop—Start and Jog Stations. Taper Attachment. 25-H.P., AC motor and control. Inspect at Albany.

***Write Today for Complete Current Stock List of Simmons Engineered-Rebuilt Machine Tools***

## SIMMONS MACHINE TOOL CORPORATION

**MAIN OFFICE AND PLANT: 1759 N. BROADWAY, ALBANY, 1, N. Y. • NEW YORK OFFICE: 50 EAST 42ND STREET**

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## UNUSUAL VALUES

**Milling Machines**—No. 1 Universal, No. 1 American (new) plain, No. 1 Vertical.

**Drills**—Large selection, single and multiple spindles also bench types, many of them new.

**Gear Cutters**—Brown & Sharpe No. 3—28" Gould & Eberhardt 48".

**Grinders**—Cylindrical B. & S. No. 11, Planer type 18"x16" Surface 12"x57", also new (small) Universal bench and floor type. All with coolant, motorized.

**Lathes**—14"x6', 8', 10'—10"x8', 3', 16'—18"x6', 8', 10'—20"x16'—all none drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 10" and 18" bench and floor type.

**Planers**—Single head 24"x8', 24"x8', 26"x8'.

**Shapers**—16", 20", 24" B.G. crank.

**Turret Lathes**—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

**SPECIAL**—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

**WOOD WORKING MACHINERY**—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

**Drill**—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel. Motor attached.

**PATTERN MAKING MACHINERY**—42"x16" bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

**THE OSBORNE & SEXTON MACHINERY CO.**

**P. O. Box 88, Columbus 16, Ohio**

---

## ALL PRICES DRASTICALLY REDUCED!!

***All Late Type***

**Bullard Multaumatics, 16", 12", 8" late**
**#42 Lucas Boring Mill 4" bar, '42 new**
**#28/60 Vertical Cincinnati Hydrotel, '44**
**2300 ton Bliss Hydraulic Press, sacrifice, late!**
**#2, #3 Cinci. Dial type, Univ. Mills**
**6'17" Column American Hole Wizard Radial Drill, AC Motor on Arm**
**5" Fisher Horiz. Floor Type Boring Mill, Late**
**5" Bar Table type boring mill, Giddings & Lewis #350T**
**#12 Brown & Sharpe Production Mills, 48½" x12" table size, $2250.00 ea.**
**#18 Blanchard Surf. Grinders 36" chuck, late type.**
**9/16", 1", 1¼", 1⅝", 2¼", 2⅝" RA6 Acme Gridley Auto.**

### SPOT WELDERS & BRAKES

**All sizes spot welders, air & foot operated. 25% off list price.**
**Hand Brakes all sizes up to 10'**

MDNA
MEMBER

**PAULS MACHINERY COMPANY**
6111 Vermont Ave. — Detroit 8, Mich.
Phone: TYLER 7-6300

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**FOR SALE**
**INDUSTRIAL CHILLING MACHINE**
**DEEP FREEZE CASCADE 120° F. Height 38" Length 82", Width 32¼", Approximately 7½ cubic feet. WITH 2 MOTORS. ½ and ¾ HP. 8/60/220. PRICE ..... $850.00**

**WINSTON MACHINERY CO., INC.**
**517 South Delaware St., Indianapolis 4, Ind.**

---

National Bent Shank Nut Tappers Battery of ⅝" to 1" Machines.
Waterbury-Farrel Fdry. ⅝" and 1" D.S. S.D. Cold Headers, also Thread Rollers.
Fisher 5" Bar, Floor Type Boring Mill. New in 1942.
Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.
Bliss Presses in all sizes up to 1,000 ton capacity.
Wire Working Machinery.

**National Machinery Exchange**
**128-138 Mott St., New York 13, N. Y.**

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## LATE MODEL BRIDGEPORT FACE GRINDERS

**#85—100" BRIDGEPORT FACE GRINDER**
New 1944. Three motor drive. Main drive motor 40 HP AC. Table 29"x100". Equipped with three magnetic chucks.

**#95—86" BRIDGEPORT FACE GRINDER**
New 1942. Three motor drive. Main drive motor 60 HP AC. Table working surface 30"x86".

**J. L. LUCAS & SON, INC.**
**P.O. Box 3006A Bridgeport 5, Conn.**

---

South Bend 14½" x 6' Toolroom Lathe, 1947.
Hendey 14" x 30" centers geared head Lathe, 1944.
Lodge & Shipley 16" x 30" geared head Lathe, 1942.

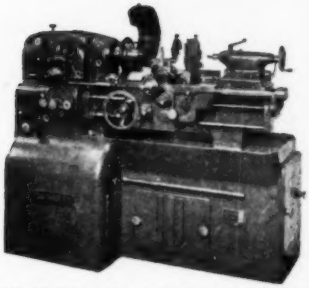
**D. E. DONY MACHINERY CO.**
**47 Laurelton Rd., Rochester 9, N. Y.**

BUY FROM STOCK
Telephone
BAKER 5887

# FALK
## MACHINERY COMPANY

18 WARD ST.
ROCHESTER 5
N. Y.

*Every Item Guaranteed as Represented*



10"x20" Model #EE Monarch Precision Toolmakers Lathe. Late Type. W/Taper Attach. Collets, chucks, toolholders, tool cabinet.

### ENGINE LATHES

LeBlond 36"x30' Q.C.G. Hvy. Duty Geared Head Screw Cutting Engine Lathe. Serial #NK-230. 12 Speed Head. 36" internal grd. faceplate, Taper Attachment, Dial Thrdg. Set of toolholders. Max. Swing—39". Centers—22'6". 25 h.p. 3/60/220/440 volts V-belt drive.

24"x6' American Q.C.G. Motorized Cone Head. 11' centers. Taper Attachment 24" chuck, faceplates, cabinet type legs. 220/440 volts motor.

18"x6' Monarch 8-Speed hd. Q.C.G. 220 volts motor. Actual swing—20¼", 20" c.c. Hex. Turret on crosslide. Cabinet legs.

16"x6' Monarch 8-Speed Hd. Q.C.G. 220 volts motor. 24" c.c. Univ. Chuck, Draw-bar & set of 16th collets and 32nd collets.

14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, Chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, Collets & Collet Chuck.

14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48". Completely rebuilt. Immediate shipment.

22"-46" x 10' Q.C.G. Putnam Extension Bed Gap Lathe. Motor, faceplates & chuck.

Bliss-Consolidated #77 Motor Driven Open Back Gap Frame Single Crank Single Action Backgeared Power Press. Has Automatic Roll Feed & Roll Straightener, also Ejector under Bed. 160 Tons Cap. 10" Stroke. Tie Rods & Inclined Base.

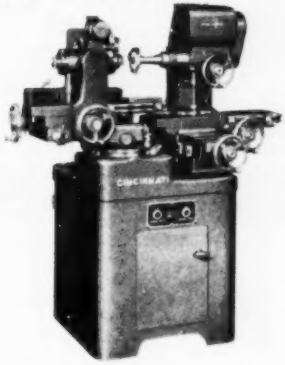
### TURRET LATHES

Bardons & Oliver #1 Electric Turret Lathe. ¾" cap. Has bar feed & collets.
Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw, Machine 1½" cap.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed 1½".
W-Swasey #3 Univ. 1½" cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.
Warner & Swasey #1A Universal Heavy Duty Saddle Type Turret Lathe. Serial #648220. Capacity —2½" rd., Gr. Hd. 12 speeds. Coolant system, bar feed, chuck & tooling. Immediate delivery.

### GRINDING MACHINES

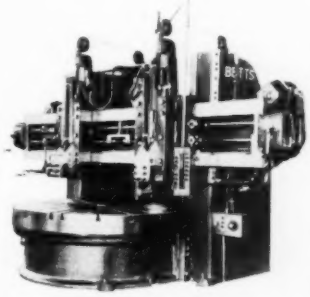
Blanchard #16 Motor Driven Vertical Rotary Surface Grinder. 26" Chuck with power down feed.
Cincinnati 10"x36" Plain Hydraulic Cylindrical Model #EA. Serial #5P2D1L-19. Filmatic Bearings. Built-in Electrics. Hydraulic Infeed.
#2 Cincinnati Universal Tool & Cutter Grinder. Late Type. Univer. Motor Driven Workhead, Diamond Bracket, etc. 220/440 volts motor.

Cincinnati 'Monoset' Model #OE Cutter & Tool Grinder. Late Type. With Taper & Cylindrical Collets, motors & Equipment. New-1942.

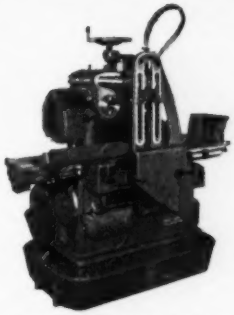


### PUNCH PRESSES

O.B.I. Toledo #5, 44 tons cap. motor dr.
O.B.I. Bliss #18, 19C, 20, 20B, 21 motorized.
O.B.I. Michigan, 36 tons cap. Wide ram & bed.
#68C Bliss Dble. Action 3-Crank.
#91C Toledo Sgle. Act. Dble. Crank S.S.
#305 Bliss S.S.S.A. 95 Tons Cap.
#3A Bliss S.A.S.S. Dble. Crank. 42 Tons.
Zeh & Hahneman 35 Tons S.A. Cam Release Spring Return. 220/440 motor.




Betts 100" Vertical Boring & Turning Mill. 1944 machine. 2 plain heads. Complete Electrical Equipment. Excellent condition. Immediate delivery.



Brown & Sharpe #12 (Electrics built-in) Late Type Milling Machine. 24" Table Travel. Motor driven coolant. Also 18" travel machines. Immediate shipment.

### MILLING MACHINES

Milwaukee #2B Dble. Overarm, Horiz.
#3 Dial Type, H.S. Cincinnati Vertical Mill. Power Rapid Traverse, speeds up to 1300 r.p.m. Range—34"x16"x16" Head has 6" vertical with four stop indicator. Serial #4A3V1L-61. Timken Bearing. 10 h.p. motor drive in base.
#3V Van Norman Ram Type Vert. Late Type.
#2, #3, #4 Cincinnati High Power Vert.
#4-36 Cincinnati 4-Spdle. Duplex Hydromatic.
#4-36 Cincinnati Plain Hydromatic.

### UNIVERSAL MILLING MACHINES

B & S #2, 20"x5"x17½".
B & S #1½, 20"x7"x18".
Bridgeport, 20'x9'x16" Turret Type.
Garvin #2MU, 24"x8"x18".
Kempsmith #2, 28"x8½"x18".
Cincinnati #2M, 28"x10"x18".
B & S #3, 34"x10"x21".
Cincinnati #3S 34"x12"x20".
Some w/index heads & equipment.

**NEW—GEMCO 20" Universal Shaper. 220/440 motor. Power Rapid Traverse, horiz. & vert. Large Discount. Immediate shipment.**

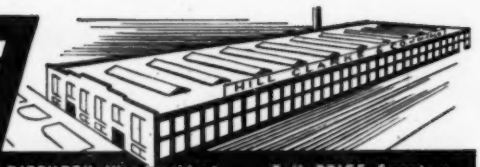
### RADIAL DRILLS

Cinci-Bickford 6' Arm, 15" Col. Speeds.
Cinci-Bickford 5' Arm, 13" Col. 24 Speeds.
Cinci-Bickford 3' Arm, 9" Col. 12 Speeds.
Cinci-Bickford 6'-19" Super Service. New in '42. 36 Spdle. Speeds. Standard Base, plus angle base. Necessary Motors.

### BORING MILLS

2½" bar Cleveland Horiz.
3⅛" bar Giddings & L. Horiz.
5" bar Barrett #2 Cylinder.
8" bar Barrett #6 Cylinder.
Ryerson #11 Horiz. 3" Capacity, #6 M.T.
24" Bullard Vertical, Motorized.
42" Bullard Vertical, Motorized.
54" Bullard Vertical, Motorized.
42" Gisholt Vertical, Motorized
60" Betts Vertical, Motorized.

# HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

### AUTOMATICS
1⅛" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅛" (1942)
No. 6 Brown & Sharpe, M.D.
No. 49 New Britain, 4 Spdl. Chucker
Model A 2½" Cleveland (1943)
Model A 3¼" Cleveland (1942)

### DRILLS
No. 150 Baker, tapping (1942)
No. D8 Colburn, No. 6 Morse Taper
No. 2 Fosdick 4 Spdl. (1942)
No. 2 Fosdick 6 Spdl. (1942)
No. 1-LMS Leland-Gifford (1942)
No. 2-LMS Leland-Gifford (1942)
No. 4BL Natco 36 Spdl. (1943)
5' Western Heavy (1942)
6'-17" Col. Fosdick Economax Radial

### GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 18H Gould & Eberhardt
72" Cincinnati Gear Cutter

### BORING MACHINES
No. 350—T Giddings & Lewis 5" Bar
No. 31 Lucas, 3" bar, M.D.
No. 46-B Heald Bore-Matic (1942)
No. 112—C Excello 2 Spdl. (1942)
36" Bullard Hi-Speed (1942)
42" Colburn, M.D.
60" Colburn M.D.
72" Niles Extra Heavy
84" Betts, M.D.

### GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders ranging from 6"x18" to 24"x240"
12"x48" Cincinnati Univ. (1946)
72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
Bryant Internal Grinders (1942)
Model HRF Barber-Colman Hob & Reamer Sharpener (1942)

### LATHES
14"x30" centers Pratt & Whitney, Model C
16"-18"x30" P. & W. Model C (1947)
16"x54" centers LeBlond (1941)
16"x60" centers Pratt & Whitney, Model B
18"x8' American, D. Head, M.D.
18"—38" gap x 10' LeBlond
36"—48"x16' Lehman Hydratrol (1945)
36"x24' Lodge & Shipley Gdr. Head
8"x15" Sundstrand, Model D (1943)
10" Sundstrands (1942, 1943)
16" & 20" Fay Automatics (1942)
No. 2 Warner & Swasey, Bar Fd. (1942)
No. 4 Gisholt Univ. Turret Lathe (1943)
No. 4B Libby, Bar Feed (1942)
No. H-5 Libby
No. 5 Bardons & Oliver (1942)
No. 5 Midland, Bar Feed (1942)
1-A Warner & Swasey (1943)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

### MILLING MACHINES
No. 2H Milwaukee Plain & Vertical (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1H-12" Milwaukee
No. 1-10 Cin. Mfg. (1940)
No. 2—18 Cincinnati, Rise & Fall (1941)
No. 2—18" Sundstrand-Electromil (1942)
30"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex (1943)
No. 45-48 Cin. Hyd. Tracer (1941)
No. 56-72 Cincinnati Hydromatic
4½"x12" Pratt & Whit., Model C Thread Mill
6"x36" Lees-Bradner—Model HT (1943)
10"x48" Hanson-Whitney Thread (1942)
24"x24"x12' Ingersoll Adj. Rail Slab Miller
36"x36"x16' Ingersoll Slab Miller, 4 Hds.
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)

### MISCELLANEOUS
19" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners

### PLANERS
36"x36"x12' Cincinnati
36"x36"x18' Gray Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

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No. 23T G. & L., 2½" table Hor. Mill, 1942
4" Univ. Table Mill, 60" vert. 96" hor., '43
36" & 42" King Side Hd. Vert. Mills, '43
Nos. 1A & 3 W. & S. Turrets, bar & chuck
Nos. 3 & 2MH Cinci. Pl. Dial Millers, late
Nos. 3K & 3H K. & T. Pl. Dial Millers, late
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicators, late
No. 9J Gorton Dupplicator & Vert. Miller (2)
12"x24" G. & L. No. 45 Surface Grinder, '42
No. 70A Heald Internal Grinder, 1942
Gear Cutter, No. 13 B. & S., spur & bevel
No. 6 M. & M. Keyseater, AC. M.D.
30"x20' cen. Axelson Lathe, T. A.
30"x120" Hanchett Plano Surface Grinder

**BENNETT MACHINERY CO.**
**30 Church St., New York 7, N. Y.**

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## WE HAVE THEM

BAUSH W-6 and W-7 Multiple Spindle Drills.
NATCO 2BL "Holesteel" Multiple Spindle Drills
50"x204" LeBLOND "Big Swing" Lathe
32"x36"x66" ROCKFORD Openside Shaper, Planer, 2 hds.
10"x72" NORTON Type "C" Plain Cylindrical Grinders.

**Wigglesworth Machinery Co.**
**203 Bent Street, Cambridge, Mass.**

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## FOR QUICK REMOVAL

HONING—#249 Barnes, Vert., Hydr. 9" x 16" (1940)
TURRET—3L Gisholt, Hard. Ways
DRILL—3 Spind. Foote-Burt, Ind. Power Feed #2M.T. 12" O/H. (1942)

**PRICE EACH $1500**

**ROSENKRANZ, WEISBECKER CO.**
**149 Broadway New York 6, N. Y.**

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## CHOICE TOOLS

20"x96" NORTON Plain Cylindrical Grinder, AC-MD
20"x96" cc AMERICAN 12 Speed Timken Spindle Lathe, taper, rapid traverse, AC-MD
30"x144" cc NILES Timesaver Lathe, 1941
36"x25' cc NILES Heavy Duty Lathe, 2 carriages, 1941
48"x20' cc BETTS BRIDGEFORD Heavy Duty Lathe, 1941

**O'CONNELL MACHINERY CO.**
**1825 Niagara St. Buffalo, N. Y.**

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## LATE TYPE MACHINES
## FOR SALE

American Hole Wizard Radial 6'x15"
Rowbottom Cam Miller
Pratt & Whitney #2 Jig Borer
Van Norman Universal Miller #22L
Van Norman Plain Miller #2L

**CAPITOL MACHINERY**
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**42"x108" NILES GEARED HEAD LATHE**

New 1943. Timkenized spindle. Power traverse to carriage by separate motor. Swing over ways 45½".

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**FOR SALE**

Westinghouse "Endogas" Gas Generator, 200 CFH, 4.5 KW, 55 Volt. Complete with controls, valves, etc. Serial No. 20P788. Price $750.00.
*PRACTICALLY NEW*

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**4½" CONE FOUR SPINDLE AUTOMATIC SCREW MACHINE**

New 1940. Motor driven with 25 HP AC motor. Two auxiliary drilling spindles, forced feed lubrication and a large quantity of equipment. Excellent condition.

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**P. O. Box 3006A BRIDGEPORT 5, CONN.**

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Bor. Mill, Hor. 4½" Bar N-B-P.
Bor. Mills, Vert. 24"-30"-42"-60"-72".
Drills, Radial, 3'-4'-5'-6' Cin.-Bick.
Grinder Surface, #2 Diamond, Mag. chuck.
Lathes, Turret, 3A W. & S., and 24" Gisholt.
Millers, Plain No. 3, 4, & 5-B Cincinnati.
Millers, Vert. No. 3 & 4 Cincinnati.
Shaper, Draw Cut, 36" Morton.
Swager, #3 Etna, 1½" tubing.

**West Penn Machinery Company**
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**FOR SALE**

**110 Ton Cleveland Press Model 11S Air Cushion, W/M—New 1946 A-1 Cond.**

SEABOARD STEEL CO., INC., New Haven, Conn.

# LATEST TYPE *Nearly New* MACHINES

**BORING MILLS—Horizontal**
CINCINNATI GILBERT 3½" bar, floor type, latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
GIDDINGS & LEWIS #25T, 2½" bar, Latest Type
GIDDINGS & LEWIS #45, 5" bar, Latest Type
HEALD 48, 49 single end, Borematic, Latest
LANDIS—#35—3½" bar, floor type, M.D.
LUCAS #41, 5" bar, Table Type, Late Type
LUCAS #45, 5" bar, Table Type, Late Type
NILES BEMENT POND 5", 5" bar, Floor Type, M.D.
UNIVERSAL 3" bar, high speed, latest type

**BORING MILLS—Vertical**
BULLARD 10" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 12" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 24", 36" Turret "New Era" Side Head, H.D.
BULLARD 24", 36", 42" Vert. Turret "Spiral Drive"
BULLARD 24", 36", 42" Vert. Turret
High Speed, Latest Type
COLBURN 72", 2 swivel heads, Rapid Traverse, M.D.
KING 62", 2 swivel heads, Rapid Traverse, AC M.D.
NILES 100", 2 swivel heads, Rapid Traverse, M.D.

**BRAKES—Power**
CINCINNATI Series 300, ¼"x8'6", Motor Drive
VERSON #2266, 10 gauge x 96", Latest Type

**BROACHES**
AMERICAN V-2, 6 ton Hyd., Latest Type
CINCINNATI 1-36, 3-36, Duplex Vertical Surface,
Hyd., Double Ram, Model ER, Latest Type
LaPOINTE 5-36 Vertical, Hyd., Latest Type

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CINCINNATI BICKFORD 21" Box Column, Latest
LELAND & GIFFORD #1LMS, 4 Spindle, Latest Type
LELAND & GIFFORD #2, #2MS, Single Spdle.
LELAND & GIFFORD #2LMS 3 and 6 spindle, Latest

**DRILLS—Deep Hole**
BARNES 426/2 Spindle Hydraulic, Latest Type
LeBLOND #2 Single Spindle, Hydraulic, Latest Type
PRATT & WHITNEY #1Bx50", Hyd., Latest Type

**DRILLS—Multiple Spindle**
NATCO #1AL, 30 Spindles, Hyd., Latest Type
NATCO D-5, 9 adjustable spindles, Motor Drive

**DRILLS—Radial**
AMERICAN 4' arm 11" col. "Hole Wizard," Latest
AMERICAN 4' plain Triple Purpose, Motor Drive
AMERICAN 5' arm 12" column Plain, M.D.
CINCINNATI BICKFORD 5'12" Column, Plain, M.D.
CIN. BICKFORD 5' arm 15 col. Plain or Univ., M.D.
DREVES 5' arm 15" column Plain, Latest Type
WESTERN 6' arm 20" column Plain, Latest Type

**GEAR CUTTING EQUIPMENT**
BARBER COLMAN #12 Hobber, Single and Double Overarm, Motor Drive
BROWN & SHARPE 6-60 Gear Cutter, Motor Drive
BROWN & SHARPE #13 Spur and Bevel Cutter, M.D.
BROWN & SHARPE #14 Gear Chamferer, Latest Type
CROSS #50 Universal Gear Chamferer,
CROSS #1 Tooth Rounder, Motor Drive
FELLOWS 6-20, 61A, 63A3, 6Z2, Model Z, 7A, 7, 72, 72S, 77 High Speed Gear Shaper, Latest Type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #12LS Lapper, latest type
FELLOWS 8M Red Liner, Latest Type
GLEASON #14 Hypoid Spiral Generator, Latest Type
GLEASON #14 12" straight bevel generator, latest type
GLEASON #14, #6, #18 Bevel and Hypoid Tester
GLEASON #1, #6, #18 Bevel and Spur Gear Planers, Motor Drive
GOULD & EBERHARDT 12H Hobber, Latest Type
GOULD & EBERHARDT 98H Hobber, with diff. M.D.
GOULD & EBERHARDT 16" Grinder, Hyd., latest
PRATT & WHITNEY 10" Grinder, Hyd., latest

**GRINDERS—Cyl.—Plain & Univ.**
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3 x 12, Latest Type
BROWN & SHARPE Plain Hyd., Latest Type
LANDIS 4x12, Type H, Plain Hyd., Latest Type
LANDIS 6"x18" Type H, Plain, Hyd., Latest Type C, Plain, Latest
NORTON 6"x18", 10"x36", 10"x72" Type C, Plain,

**GRINDERS—Miscellaneous**
BARBER COLMAN #3, #4 Hob Sharpener, Latest
BROWN & SHARPE No. 13 Universal Cutter & Tool, Lat.
BROWN & SHARPE No. 24—36" Internal, Hyd., Latest
BRYANT #16-CP-16, #24—36" Internal, Hyd., Latest
CINCINNATI #2, #3, Centerless "Filmatic," Latest
CINCINNATI "Monoset" Tool & Cutter, Latest Type
FITCHBURG 24-53" Disc Grinder, Latest Type
HARDINER 24-53" Disc Grinder, Latest Type
GLEASON #12 tool sharpener, Latest Type
HEALD 72A3, 72A5 "Gagematic,"
HEALD 75A, 72A3, 72A5, 74, Internal, latest
HEALD 75A, 72A3, 72A5, 74, Internal, latest
JONES & LAMSON 6x15, 8x18 Auto Thread, latest
LANDIS #6, 6x24 Thread, latest type

PRATT & WHITNEY 6"x60" Centers, Model C, Thread Milling Machine—4-1 32" hole through spindle, Latest Type

LANDIS #6, 8x24 Thread, latest type
LANDIS #12 Centerless, Hydraulic, Latest Type
THOMPSON 6"x48" Auto., rd. broach, MD

**GRINDERS—Surface**
BLANCHARD #11, 16" dia. mag. chuck, Latest
BLANCHARD 16A Vert., Dial Feed, MD
BLANCHARD Model G-7, 9"x20", Hyd. Latest
DO-ALL Model G-7, 9"x20", Hyd. Latest
HANCHETT Series 300 13"x48" Vert. Hyd. Latest
HANCHETT #26, Vert., 36" dia. mag. chuck, latest
HANCHETT #120, 30x120" Plano, Hyd., Horiz., Latest
HEALD #22 Rotary, 12" chuck, latest type
HEALD 25A—rotary—16" and 30" chuck, Hyd., Latest
NORTON 6x18 Hydraulic, latest type
THOMPSON 12x12x24 Type D Hyd., Latest

**JIG BORERS**
KEARNEY & TRECKER Model B, Auto., Latest
PRATT & WHITNEY 1A, Motor Drive

**LATHES—Engine and Mfg.**
AMERICAN 30"x360" cent., 2 carr., M.D.
BRIDGEPORT 30"x32" bed, 2 carriages, M.D.
HENDEY 12x30", 14x30", Tinken, Latest Type
JONES & LAMSON "Fay" 20x25", Motor Drive
LeBLOND 21"x60" Centers, TIMKEN, latest type
LEHMANN 16x30" centers, 14"x30" Timken, Latest
LODGE & SHIPLEY 10"x30", Motor Drive
LODGE & SHIPLEY 18x72 centers, Motor Drive
LODGE & SHIPLEY 14x60, 4x84, 8x60, 8x108, 5x34, Latest
LOSWING 4x60, 4x84, 8x60, Model EE, Timken, lat.
MONARCH 10"x20" centers, Model CK, Timken, latest
MONARCH 12"x30" Centers, Model CK, Timken, latest
MONARCH 12"x54" Centers, Model CW, Latest
MONARCH 16"x72" Centers, Model CW, Latest
MONARCH 22"x456" centers, 3 Carriages, Timken
Bearing, Model CM, Motor Drive
MONARCH 24"x54" Ball Bearing, Geared Head, M.D.
NILES 30"x50" Boring "Time Saver" Timken, Latest
NILES 30"x50" Boring "Time Saver" "Timesaver," 2 carriages, Rapid Traverse, Latest Type
PRATT & WHITNEY 16"x30" Centers, Timken, Latest
PRATT & WHITNEY 10"x20" centers, Timken, latest
PRATT & WHITNEY 42"x25" Centers, Motor Drive
PUTNAM 42"x25" Centers, Model A, Latest
REED PRENTICE 20"x54" Centers, Timken, latest type
SPRINGFIELD 16"x30" centers, Model A, Latest
STRINGFIELD 16"x30" centers, Timken, latest type
WARD, HAGGAS & SMITH—18/30x60" centers gap, motor drive, Latest Type

**LATHES—Hob and Cutter Relieving**
MICHIGAN 1712 Universal, Latest Type
S. TOOL #816B, Latest Type

**LATHES—Turret**
BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
CINCINNATI ACME "Fastermatic," Timken, Latest
FOSTER #4FU "Fastermatic," Timken, Latest
GISHOLT #1L, #2L, #3L Universal, Latest Type
GISHOLT #5, #4, univ., TIMKEN, Timken, Latest
GISHOLT & LAMSON #3, #5, Univ., Timken, Latest
JONES & LAMSON #3, 1H5 Univ., Timken, latest
LIBBY "International" 1H5 Univ., Timken Bearing, latest
MOREY No. 2, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON 2SD2E, Timken, Latest
POTTER & JOHNSTON 2SD2E, Universal, Timken Bearing
WARNER & SWASEY #2, #3, Timken, Latest Type
WARNER & SWASEY #1A, Univ., Timken, M.D.
WARNER & SWASEY 2A Universal, Timken Bearing.
WARNER & SWASEY 2A Chucking, Latest Type
"Pre-selector," Bar and Chucking, Latest Type
WARNER & SWASEY 3A Universal, Timken Bearing,
Bar and Chucking, Latest Type
WARNER & SWASEY 4A Universal, Timken Bearing,
Bar and Chucking, New 1947

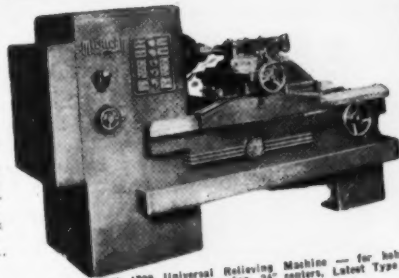
**MILLING MACHINES—Mfg.**
HALL style L, Planetary, latest type
INGERSOLL 42"x18"x12" adj. rail, 4 heads, AC, M.D.
INGERSOLL 42"x18"x12" adj. Plain Type, 2 heads, AC, M.D.
INGERSOLL 32x24x16" adj. rail slab, M.D.
INGERSOLL 30x24x12" adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex 42" feed, Latest
TAYLOR & FENN Mod. 2 Spline, latest

**MILLING MACHINES—Plain**
BROWN & SHARPE #2, Light Type, Timken, Latest
BROWN & SHARPE #12, 24" feed, Latest Type
BROWN & SHARPE #000, Timken, Latest Type
BROWN & SHARPE #2, 3B, Timken, Latest Type
BROWN & SHARPE #2, 2-12, Automatic, Latest Type
CINCINNATI #5, 2-12, 2-18, Automatic, Latest Type
CINCINNATI #3, #4, #5, High Power, Latest Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
KEARNEY & TRECKER 2H, 3H, 4H, 5H, Latest
KEARNEY & TRECKER 1218, 1404, Simplex, Latest
KEARNEY & TRECKER #3O, #4, Timken, Latest Type
KEMPSMITH #3O, #4, Timken, Latest Type
KEARNEY & TRECKER 4K, Timken
Bearing, Latest Type

**MILLING MACHINES—Thread**
BRANDER 12"x54" Centers, Latest Type
12"x30", 60", 120", 190" centers,
PRATT & WHITNEY 6"x60" centers, Model C, Latest

**MILLING MACHINES—Universal**
BROWN & SHARPE No. 2A, Timken Bearing, Latest
BROWN & SHARPE No. 3A, 4A, M.D.
BROWN & SHARPE No. 4, Timken, Latest Type
KEARNEY & TRECKER 2H, Timken, Latest Type
KEMPSMITH #4 Maxi-miller, Timken, latest type
VAN NORMAN #3 duplex, Motor Drive
VAN NORMAN #12, #26, #36, Timken, Latest Type

**MILLING MACHINES—Vertical**
BROWN & SHARPE #2 Standard Timken, Latest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CINCINNATI #08, TIMKEN, Latest Type
CINCINNATI Super-Speed, Latest Type
GORTON 8D, 8½D, Timken, Latest Type
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MOREY 12M Single & Double Spindle Profiler, Latest
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**PLANERS**
BETTS (CONSOLIDATED) 24"x92"x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
BETTS (CONSOLIDATED) 108"x216"x36' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
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NILES 108"x84"x42' 4 heads, Box Table, 3 Heads, NILES 42"x12"x14' "Time Saver," Box Table, Rapid Traverse, D.C., M.D., Late Type
NILES 48"x48"x14', 4 Heads, PRT. Box Table, M.D. PRT. VARI VOLTAGE Drive, Latest

**PRESSES**
BIRDSBORO 225 ton, vert. hyd., Latest Type
BLISS 75-25 Hydro-Dynamic, Double Action, Latest
GLEASON 15" Quenching, Hyd., Motor Drive
HENRY & WRIGHT 10 ton Dieing, Roll Feeds, M.D.
LAKE ERIE 500 ton Vert., Hyd., Latest Type
NILES 400 ton, Horiz. wheel, Motor Drive
UNITED ENG. 500 ton, Vert., Hyd., Latest

**SCREW MACHINES—Automatic**
CLEVELAND 9/16", 1 1/16" Model A, Latest Type
CONOMATIC 1¼"—6 spindle, Latest Type
GOSS & DeLEEUW 6"x26¾", 5 spindle Chucker, Tool rotating, Latest Type
GOSS & DeLEEUW 8" 5 spindle Chucker, Work Rotating, Latest Type

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AMERICAN 20" Heavy Duty, Motor Drive
DILL 20"-24" Vertical, Motor Drive
DILL 20"-24" Vertical, 20", 32", High Duty, M.D.
GOULD & EBERHARDT 20", 32", High Duty, M.D.
PRATT & WHITNEY 6" Vertical, M.D.
SMITH & MILLS 16" high speed, latest type

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QUICKWORK #6, 1" Cap., Rotary Shear, M.D.

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BAKER #5 Keyseater Motor Drive
BARNES #172, 306H, 307, 307B Vertical Hone, Hyd., Self-Oiling, Latest Type
CAMPBELL #401 Abrasive Saw, Latest Type
DE LAVAL #194 Coolant Clarifier, Latest
LANDIS 2" Single & Double Spdle. Bolt Threader, MD
MANVILLE 20 7/16" Cap. SSSD, Ball Header, M.D.
NAZEL, #4B Pneumatic Hammer, M.D.
NORTON #2F 10U Vertical Lapper, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416, Type G, Copying, 2 and 3 dimensional, Latest Type
PRATT & WHITNEY ¾B, 50 Rifler, Latest Type
ROWBOTTOM Cam Miller, Motor Drive

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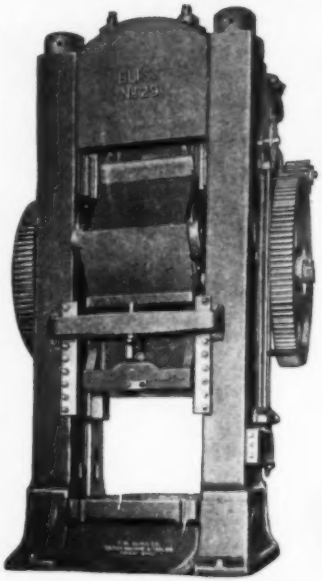

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| CAPACITY . . . | 1200 TONS | 1500 TONS |
| STROKE . . . | 5 " | 6 " |
| DIE SPACE . . . | 33½ " | 36½ " |

**DOUBLE BACK GEARED**

*Pneumatic Operated Friction Clutch*
*Equipped with Two Station Air Operated Dial Feed*
*— Bottom Lift Out — And Air Operated Pickoff*

***Also:* 27 K Bliss Coining.**
**78 Toledo Permanently inclined (2).**
**#2719—800 Ton Hamilton Press.**
**486 Hamilton Double Crank.**
**40-T-6 Minster with side shear.**

## EMERMAN MACHINERY CORP.

*870 W. 120TH STREET* *CHICAGO 43, ILLINOIS*

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**PRACTICALLY NEW**

***Model #150 Defiance Hydraulic Horizontal Boring, Drilling and Milling Machine, Table Type.***

5" diameter bar, quick change feeds and speeds, length of bed 10', working surface of table 48" x 84", Serial No. 1606-42, Mfg. in 1942.

**PRICE** .....$17,500.00

*WILL TRADE FOR OLD STYLE CONE DRIVEN MACHINES.*

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**WINSTON MACHINERY CO., INC.**
517 S. Delaware St., Indianapolis 4, Ind.

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#3R Gisholt Turret Lathe 6¼"
#2 and #3 Warner & Swasey Turret Lathes
42" and 54" Bullard SPIRAL DRIVE Vertical Turret Lathes
12" 6-spdl. Bullard Mult-Au-Matics (2)
#32 Lucas Horizontal Boring Mill
36"x25' centers Niles Bement Pond Lathe
13"x30" centers Pratt & Whitney Lathe "B"

**HAZARD BROWNELL MACHINE TOOLS, INC.**
350 Waterman St., Providence, R. I.

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**DRILLING MACHINE**
**Model H-3**

Barnes HYD-RAM. Extra High Column Machine, provided with hydraulic dwell. 8 Speeds.

**TOLEDO MACHINERY MART**
6225 Benore Rd., Toledo, Ohio

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**THREAD MILL**

LEES & BRADNER SER. HT 612
6" Spin. hole, Swings 18" x 102" Gearing, collets, fifty hobs mostly new.

**Price** .....$3,750.00

**SIGNAL HILL MACHINE WORKS**
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#5HM KEARNEY & TRECKER PLAIN MILLER

Late model. Main drive motor 20 HP AC. Separate feed and rapid traverse motor—5 HP AC. Table working surface 53¾"x12¾".

**J. L. LUCAS & SON, INC.**
P. O. Box 2006A BRIDGEPORT 5, CONN.

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***PRACTICALLY NEW***

American Ring Metal Turnings Crusher, Type ST.T., Machine No. 2400, Serial No. 1924.

Capacity—Steel Turnings 2½ to 3¼ Tons Per Hr. PRICE.....$1500.00

**WINSTON MACHINERY CO., INC.**
517 South Delaware St., Indianapolis 4, Ind

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## LATE TYPE MACHINE TOOLS

**AUTOMATICS**
6" RPA-8 Acme-Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. 1941.
1¾" Greenlee, 6 spindle. 1942.
9/16" RA-6 Acme-Gridley. 1942.
No. 60 New Britain, 1" cap. 1943.

**BORING MACHINES**
No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 46B Heald Single End. 1940.

**DRILLS**
3'-9" Morris "Mor-Speed". Latest.
25" Fosdick "Economax". 1941.
No. 217 Baker, box column. 1942.
No. 5 BM Fosdick, box column. 1942.

**GEAR EQUIPMENT**
3" Gleason Generator. 1941.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL Red Ring Shaver. 1942.
No. 624A3 Fellows Side Trimmer. New.
No. 615A & 61A Fellows Shapers. 1943.
No. 7125A & 712 Fellows Shaper. 1943.
Vinco Spline & Gear Grinder. 1942.

**GRINDERS, CYLINDRICAL**
16"x36" Cincinnati Plain. 1942.
12"x48" Cincinnati Univ. 1943.
10"x72" Landis Plain. 1942.
10"x18" Norton Plain. 1942.

**GRINDERS, INTERNAL**
No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

**GRINDERS, SURFACE**
12"x16"x60" Thompson Hyd. Latest.
No. 22 & 25A Heald Rotary. 1943.
No. 2-1 Reid, 6"x18" cap. 1940.

**LATHES, ENGINE**
45"x192" Axelson. 1942.
28"x276" Bertram. 1942.
24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.

**LATHES, PRODUCTION**
Gisholt "Simplimatic." 1940.
No. 3A L&S "Duomatic." 1943.
No. 2FU Foster "Fastermatic." 1943.
8'x108" Lo-Swing Semi. Auto. 1942.
Model 8, 10 & 12 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic." 1941.
20"x25" Fay Automatic. 1942.

**LATHES, TURRET**
36" Bullard Vertical. 1943.
No. 2A & 3A Warner & Swasey. 1943.
No. 1 & 8½'x24" Acme Univ. 1943.
No. 2, 3 & 4 Warner & Swasey. 1943.
No. 2, 3, 5 & 7 Bardons & Oliver. 1942.

**MILLS, PLAIN**
No. 5 Cincinnati. 1943.
No. 4 Cincinnati Dial Type. 1942.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No. 2HL Milwaukee. 1942.

**MILLS, PRODUCTION**
BL-2420 P&W "Keller" 3 sp. 1942.
BL-2416 P&W "Keller", 1 sp. 1943.
BG-1 Keller, single spdl.
No. 1-14 & 2-20 Kent Owens. 1942.
No. 1248 Kearney & Trecker. 1942.
No. 1-18, 2-18 & 2-24 Cincinnati. 1942.

**MILLS, THREAD**
6"x60" Pratt & Whitney. Latest.
12"x54" Lees Bradner. 1943.
4"x9" Hanson Whitney. Late.

**MILLS, UNIVERSAL**
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 2SU & 26SU Van Norman. 1942.

**MILLS, VERTICAL**
No. 3B P&W Univ. Die Sinker. 1943.
No. 2K & 3H Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1942.
No. 1 Cleveland. 1942.

**PRESSES**
No. 40-S ½ Minster. 1942.
100 Ton Hannifin, Hyd. Str. 1942.
50 Ton Denison, Hyd. Str. 1942.

**INDIANAPOLIS MACHINERY & SUPPLY CO.**
1961 S. Meridian St.
INDIANAPOLIS 6, IND.

# A PARTIAL LIST OF LATE MODELS

### AUTOMATICS
Brown & Sharpe #000, H.S., #4, #6, #2G (1½")
Conomatic 8 sp. 1⅞" cap.
New Britain Gridley 61—6 Sp. 2¼"

### BORING MILLS
Giddings & Lewis #8, #25T, Bullard, 42" V.T.L.
Universal 3" horiz., Lucas #3I horiz.

### DRILLS AND RADIALS
Canedy-Otto 3'-9" col.
Carlton 8'-19" col., Foote-Burt 6 Sp.
Cinci-Bickford Super-Service 21", 24"
Natco Model E-5 Multi-Spindle, 14 spindles
Sibley 24—28", Allen 6 Sp., Excelsior 21"

### ENGRAVERS
Gorton #3U, 3Z, 3L; Deckel GI.
Gorton Cutter Grinders 375-2, 265-5

### GEAR EQUIPMENT
Fellows #72, 725 High Speed, Mikron Gear Hobber
Michigan, Gleason, Fellows Checkers
Gleason #2 Surface Hardener

### GRINDERS—Miscellaneous
Brown & Sharpe #5 cyl., 3"x18", Black Diamond
Brown & Sharpe #1, #2, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic
Cincinnati Universal Filmatic, 12"x36", 12"x48"
Covel #9IA Utv. Tool & Cutter
Gardner #226, 30" disc. Heald #1 Tool
Heald #72A3 Int. Sizematic
K. O. Lee Tool & Cutter
Landis #4H Cyl. 4"x12", #6 Thread, Landis Centerless
Norton #2 Tool & Cutter, Porter Cable Belt WG8
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6, Grenby Int.

### GRINDERS—Surface
Abrasive #34 Vertical, #33
Atlantic 6x18" Power Feed, Foote-Burt Hammond
Blanchard #18—42" chuck, #11—16" chuck
Brown & Sharpe #2
G. & L. #25, #35 Hyd., 6x18" & 8x24"
Hanchett #300, 13x48", Mattison 14x18x48 Hyd.
Norton 6x18" Hyd., Pratt & Whitney 12x40" Vert.
Reid #2A P.F., #2C Pope & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

### LATHES
Bradford 16"x6', Hardinge Precision 9", cabinet
Hendey G. H. 16x30 with relieving att.
LeBlond Regal 10"x3'-,", 13x36", 19x48", 21x60"
Ledge & Shipley 16x78" T.A., LeBlond HD 16x33"
Monarch 10"x20" EE, 16x78" T.A., 12x30" CKK
Monarch Model CKK 12x30" Dble. Compound
Rivett Precision, Logan 10"x30"
South Bend 9"x3', 9"x3½', 13x36", 18" Cabinet
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet

### LATHES—Turret
Acme #6W Bar and Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, #2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck—2L Saddle type
Hardinge ESM, 2nd operation
Jones & Lamson #8A Univ., Saddle, Threading
Oster #60t Rapiduction
Warner & Swasey #3, #4, #4A—8" Bar Cap.

### MILLS—Plain & Universal
Brown & Sharpe #2B Pl., #2A Univ.
Cincinnati #3 Plain, 2M H Univ.
Milwaukee #2HL, 2H, Plain, #2HL, 2H, Univ.
Van Norman #12, 20, 22L, 36 Kempsmith 2G

### MILLS—Vertical—JIG BORERS
Brown & Sharpe #2, Index, Vernon, Bridgeport
Cincinnati #4, Jackson
Gorton #8D, 9J Plain, #8½D Duplicator
Kearney & Trecker #5M, 3H High Speed O.T.
P&W 1½B Jig Borer, Sip Jig Borer #MP-5
Moore Jig Grinder, Vernon Jig borer
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

### MILLS—Production
Brown & Sharpe #000, 12, 2I
Cincinnati #1-12, 1-18, 2-18 Mfg.
Nichols Hand, U.S. MM 1, Kent Owens #1V
Sundstrand #00 Rigidmills, U. S. Duplex

### PRESSES
Bliss #8 Dbl. Crank, Bed 42x96", 250 Ton
Bliss #675, 645B, 650 Hi-Production, 304A, 305A S.S. Geared
Bliss #20, 2I O.B.I., #4½ Double Action Cam
Bliss #50 OB, Gap Frame #62, 62A, 102
Ferracute Notching #CB2
General Flexible Electric Screw Press
Henry & Wright 25, 75 Ton Dieing
Reliance #45 O.B.I.
V. & O. #102 Reducing
Zeh and Hanneman 30 tons & #7 Percussion

### MISCELLANEOUS
BAND SAW: DoAll V16, Tannewitz #36M, 36" Marvel #8
BENDING ROLL: Buffalo #6, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
HACKSAW: Marvel #6A Automatic, #6, #4B
HONER: Micromatic #H-1 Hydrohoner, Sunnen
KEYSEATER: Mitts & Merrill, Baker, Davis, Burr
RIVET HAMMERS: Hi Speed, all sizes, Chic. Pneumatic
ROUTER: Onsrud #W240, #55 Oliver
SHAPER: 32" G. & E. Universal
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
VERTICAL SHAPER: 6" Pratt & Whitney
WELDERS SPOT & SEAM: Taylor Winfield, Eisler 50 KVA, Thompson
WRAPPING ROLL: Buffalo #1½

### HYDRAULIC EQUIPMENT

| Cap. | Manufacturer | Platen | Stroke | Opening |
|---|---|---|---|---|
| 500 Ton | Lake Erie | 35x36" | 30" | 60" |
| 600 | Bald. S'thw'k | 76x50" | 22" | 30" |
| 500 D.A. | H.P.M. | 36x36" | 24" | 30" |
| 1000 | Franch Oil | 53x42" | 20" | 50" |
| 350 | Verson | 40x40" | 36" | 72" |
| 50 | Dennison | 22x20" | 18" | 23" |
| 150 | Southwark | 34x30" | 30 2' to 4' | |

### UP MOVING RAM PRESSES
3000 Ton Tryout and Hobbing
300 Ton Watson-Stillman Hobbing, NEW.
600 Ton Birdsboro 42x32 platen—20" stroke
900 Ton Birdsboro 40x32 platen—20" stroke
800 Ton Birdsboro 40x32 platen—20" stroke
600 Ton Southwark 34x23 platen—20" stroke
100 Ton Stokes self contained Molding
300 Ton Dunning and Boschert Molding Press
300 Ton Watson-Stillman 24x20 platen—8" stroke
500 Ton Self contained Shaft Straightener.
300—500—600 Ton Wheil Presses

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45 Crosby Street — New York 12, N. Y.
WOrth 4-8233 — Cable: AARMACH. N. Y.

## CHECK THIS LIST OF FINE TOOLS

### AUTOMATICS

½", No. 0 Brown & Sharpe
⅝" Acme Gridley model R6
⅞" & 1¼" Cone 4 spindle
1⅛" Cleveland 4 spindle
1⅛" Greenlee 6 spindle
1⅛" New Britain 6 spindle
1⅞" Cocomatic 8 spindle
2"x18" Cleveland model B
2⅛" Acme Gridley model RA6
8" Bullard Multaumatic
No. 2 FU Foster Fastermatic
No. 16 New Britain 6 spdl. chucker
14"x18" Fay chucker

### BROACHES

No. 1 Foote Burt duplex surface
2 ton American horiz. hydraulic
No. 3 Oilgear horiz. hydraulic
No. 10-72 Colonial horiz. hydraulic
No. 3 Lapointe screw type
10"x72" Colonial broach sharpener

### DRILLS, MULTIPLE

72 spdl. Baush two way
42 spdl. No. B 16 Natco
34 spdl. No. 30 Natco
24 spdl. No. B4A Natco
22 spdl. No. 14 Natco
16 spdl. No. 2 BL Natco
12 spdl. No. 39 Natco rail
12 spdl. No. 25 Baush rail
8 spdl. No. 11 Natco

### GRINDERS

No. 72A3 Heald Sizematic internal
No. 72A3 Heald Sizematic centerless
Nos. 72A3, 72A5 & 74 Heald plain
No. 75A Heald hand feed
Nos. 16A16, 16-28, 16-36, 16CP16 & 24-36 Bryant
Model MHI Sav-way hydraulic
Size 1C Greaby internal
No. 2 Cincinnati centerless
No. 10 Blanchard surface
Nos. 3 & 34 Abrasive surface
8"x24" Wilmarth Morman surf.
12" & 16", No. 22 Heald rotary surf.
16" & 24" No. 25A Heald rotary surf.
24"x48" Springfield surface
No. 2 Norton universal tool
Model 4T Sellers tool
No. R6 Pratt & Whitney tool
Nos. 51 & 510 Oliver drill
No. 10G Sellers drill
Nos. 33 & 35 Excello thread

### LATHES, TURRET

Model 6.2 Denver
Nos. 2 & 3 G Morey
No. 4 Midland
Nos. 5 & 7 Bardons & Oliver
No. 3 Jones & Lamson
No. 5 Foster
Nos. 2, 3, 4, 1A & 3A Warner Swasey
Nos. 3, 4, 5, 3AL & 28" Gisholt
24" & 36" Bullard vertical
No. 2 FU Foster Fastermatic
3"x36" & 4"x34" Jones & Lamson

### MILLERS

No. 2H Kearney & Trecker univ.
No. 3 Cincinnati universal
Nos. 2A5, 3B & 4B Milwaukee plain
Nos. 2, 3 & 4 Cincinnati vertical
Nos. 2H & 3H Kearney Trecker vert.
No. 3V Van Norman vertical
No. 3 Kempsmith Maximill vert.
Nos. 1-12, 1-18, 2-18 & 2-24 Cint. auto
Nos. 0-8 & 2-18 Cint. Rise & Fall
Nos. 3-24, 34-36, 4-36, 4-48, 5-48, 56-72 and 56-90 Cincinnati Hydromatic
Nos. 1H-12", M18, M24 & 12-24 Kearney & Trecker

### PRESSES

1000 ton Southwark hydraulic
1000 ton No. 666 Toledo coining
600 ton No. 2316½ Hamilton forging
250 ton No. F1350-42 clearing
300 ton French Oil hydraulic
49", No. 93½ Toledo double crank
Nos. P1, P2, P3, P4, P5, PG5 Ferracute
No. 6 American Can OBI

**MILES MACHINERY CO.**
**SAGINAW, MICH.**

## LEADERS... in Values!

### UNIVERSAL MILLERS

B & S #2 Lite Type—wkg. tbl. 45"x10"—range 28"x10"x13"—rpd. trav.

Cinn. #1M—rect. over., motor in base—wkg. tbl. 40"x10½"—range 28"x8"x18"—rpd. trav.

Van Norman #2SU Knee Type—wkg. tbl. 50"x12" — range 28"x10"x17" — attchmts (Very Late).

### PLAIN MILLERS

B & S #2 Lite type—wkg table 50½"x10"—range 28"x10"x15"—rpd trav.

Cinn. #2M Rect. Over.—motor-in-base—wkg. tbl. 49"x10½" range 28"x10"x19"—rpd trav.

Cinn. #3 Dial type—Hi Speed—rpd. trav. in all directions wkg. tbl. 62½"x15¼".

Milw. #5H Med. Spd.—wkg. tbl. 94"x18" — range 52"x16"x20" — rpd. trav. all directions.

### SURFACE GRINDERS

Mattison 24"x18"x36"—Hydr.—Hi Power—Chuck Generator—coolant (late).

Blanchard #18—30" chuck (late).

### GRINDERS (Misc.)

B & S #2—14"x30"; #4—14"x60"—Univ.—Tooling & attchmts. (very late).

Cinn. 14"x72"—Hydr. Univ.—Film. Brg. (very late)

Cinn. #2 and #3 Centerless—Film. Brg.—Long bar and Auto. infeed attchmt.

### AUTOMATIC SCREW

New Britain #60 1"x5" Auto.—3875 Max. rpm.—quantity Tooling—1943

National Acme RA 9/16" 6-spdl. 2885 max. rpm.—tooling and attchmts (very late).

Cleveland 3¼" and 5¾" Model "A" Auto. Screw—quantity of tooling (very late).

### RADIAL DRILLS

Morris "Mor-Speed" 4'9" Column Hi-Duty motor-on-arm #4 Taper (very late).

Cinn. Bickford 4'11" "Super-Service" motor-on-arm #4 Taper (late).

Fosdick 5'17" motor-on-arm "Economax" Hydraulic—1406 max. rpm. #5 Taper (very late).

(New) Rafter All Steel Power Squaring Shears—available two sizes ¼"x10' mild steel, ⅛"x10' stainless steel: 3/16"x12' mild steel, 3/32"x12' stainless steel—stock delivery.

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3 P & W 6" Vertical Slotters, Never Used.

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Late model. Four AC motor drive. Longitudinal travel of table **48"**. Vertical travel of head 12". Table working surface 24"x84".

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**330 W. 42nd St., New York 18, N. Y.**

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### PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 1A Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1½, 2, 3 Cincinnati, cone
No. 2B Brown & Sharpe, m.d., latest
No. 2 Cincinnati H.S. Dial, m.d., latest
No. 2 Rockford, m.d.
No. 2HL Milwaukee, m.d., latest
No. 2MH Cincinnati, m.d., latest
No. 3B Brown & Sharpe, m.d., late
No. 3, 4 Kempsmith Maxi-Miller, m.d.
No. 3B Milwaukee, m.d.
No. 3 Van Norman Duplex, s.p.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Ohio, cone
No. 5 Cincinnati, rect. overarm, m.d.
No. 5 H.D. LeBlond, s.p.d.
No. 5B Brown & Sharpe Heavy, m.d.
No. 25 Becker, cone

### UNIVERSAL MILLING MACHINES

No. 1B Milwaukee, m.d.
No. 2 Cincinnati, cone
No. 2A Brown & Sharpe, s.p.d.
No. 2 Cincinnati Medium Speed Dial, m.d., latest
No. 2 Cincinnati, cone, motorized
No. 2M Cincinnati, m.d.
No. 2 Kempsmith, cone
No. 3 Kempsmith, cone
No. 4A Brown & Sharpe, m.d.
No. 4 Cincinnati H.P., m.d.
No. 4 R.G. LeBlond, s.p.d.

### VERTICAL MILLING MACHINES

No. 0B Cincinnati, m.d., latest
No. 2M Cincinnati, m.d.
No. 2, 3, 4 Cincinnati H.P., m.d.
No. 2, 3, 4 Cincinnati High Speed Dial, m.d., latest
No. 2, 3 Cincinnati Medium Speed Dial, m.d., latest
No. 2H, 4H Milwaukee, m.d., latest
No. 2HL Milwaukee Swiveling Head, m.d., latest
No. 2K, 3K, 4K Milwaukee Dial, m.d., latest
No. 2½B, 3B, 4 Milwaukee, m.d.
No. 3V Toledo, s.p.d.
No. 3V Van Norman, m.d., latest
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed Prentice, m.d., latest
No. 6 Becker, cone
Cincinnati Hydromatic, m.d., 2 spindles

### SHEET METAL MACHINERY

No. 411D Toledo Power Squaring Shear, m.d.
No. 3 Hilles & Jones Plate Bending Rolls, m.d.
No. 1 Savage Nibbler, m.d., 34" throat
Gray Turret Head Metal Cutter, cap. ¼", 36" throat
No. 2 Libert Nibbler, 28" throat
Southwark Rotary Metal Cutter, 36" throat, m.d.
1209" No. 100 Niagara Heavy Production Folder, 16 ga., m.d.

### SLOTTERS

10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
20-24" Dill, m.d.
42" Niles-Bement-Pond Geared, m.d.

### TAPPERS

No. 1 Bakewell Precision, m.d.
No. 1R Bakewell Precision Radial Tapper, m.d., latest
No. 2 Bakewell Precision, m.d.
No. 3 Webster & Parks, belt
No. 10 Kaufman High Duty Oscillating Pneumatic, m.d.

### SHAPERS

18" Invicta Shaper, m.d. thru gear box, new
24" Invicta Shaper, m.d. thru gear box, new
24" Potter & Johnston, cone
32" Morton Draw-Cut, m.d., late
36" Morton Draw-Cut, m.d., late
48" stroke Heavy Duty Morton H.D. Traveling Head Draw-Cut Shaper, m.d., with d.c. variable voltage equipment, 12' bed, latest type

### MISCELLANEOUS

No. 2A Pratt & Whitney Jig Borer, m.d.
Gisholt Precision Balancing Machine, m.d.
96" Ohio Extra Heavy Worm Feed Revolving Table, m.d.
40" Tolhurst Chip Wringer, m.d.
Detrick & Harvey 2 spindle Profiler
No. 12M Morey, 2 spindle Profiler, m.d., latest
No. 12 Pratt & Whitney 2 spindle Profiler, m.d.
No. 20 PH A.D. Conk Deepwell Pump with Chrysler Engine and 200' of 8" pipe, brand new
Wagner Saw Sharpener, m.d.

### HAND MILLING MACHINES

United States, vee belted m.d.
No. 1 Kent-Owens, m.d.
Atlas Model MF Bench, m.d.
No. 1 Standard, m.d.
No. 2 Producto matic, m.d.
No. 3 Garvin, m.d.

### PLANERS

P10 Coulter Crank Type Shaper-Planer, 1 head, m.d.
20"x20"x5' Whitcomb-Blaisdell Planer, belted m.d., 1 head
24"x24"x6' Cincinnati, m.d., 2 heads
24"x24"x10' Whitcomb-Blaisdell, 2 heads, m.d.
30"x30"x10' Gray, 2 heads, belt
30"x30"x14' Gray, 2 heads, belt
32"x32"x16' Gray, 2 heads, belt
36"x36"x10' Niles, 2 heads, belt
36"x36"x18' Niles-Bement-Pond, 2 hds, reversing m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
38"x38"x20' Gray Spiral Drive, 2 heads, belt
42"x42"x26' Gray, 2 heads, belted m.d.
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, m.d.
48"x48"x32' Niles-Bement-Pond, 4 hds, reversing m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
62"x62"x40' Cincinnati, 4 heads, reversing m.d.
66"x60"x40' Niles-Bement-Pond, 4 hds, reversing m.d.
72"x72"x36' Niles 4 heads, reversing m.d.
90"x72"x18' Pond, 4 heads, belted m.d.

### SAWS

6x6" Peerless Hack Saw, m.d.
6x6" Peerless Hydraulic, m.d.
6x6" Peerless Universal, m.d.
7½ H.P. Cincinnati Elec. Tool Co. Abrasive Cut-Off Machine type JCAW
DeWalt Model ME 1 Abrasive Cut-Off Machine, m.d.
No. 3 and 8 Nutter & Barnes Cold Saws
No. 6 Cochran Bly Cold Saw
No. 138 Espen Lucas Cold Saw, m.d.
Gustav Wagner Cold Saw, m.d.

### PRESSES

No. 3 Bliss Stiles Type Press, belted m.d.
No. 20 V & O, m.d.
Ferracute Double Crank, 36" between uprights, 94 T. Cap.

*We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Let us quote on your requirements.*

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Nearly new — Model 3 & 4
Hand Screw Machines — Bar Feeds
DRASTIC PRICE REDUCTION

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36" x 36" x 16' CINCINNATI HYPRO OPENSIDE PLANER

New 1941. Two swivel heads on rail and right hand side head. Main drive 25 HP DC with 25 KW motor generator set driven by 50 HP AC motor 220/440 volt. Like new condition.

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28 Mirror finished (both sides) type 430, stainless steel polishing plates, all new, packed in original cases.

| Quantity | Sizes |
|---|---|
| 201 | 27" x 52" x .050" |
| 200 | 27" x 56" x .050" |
| 402 | 26.5" x 62" x .060" |
| 717 | 26.5" x 52" x .040" |
| 535 | 26.5" x 56" x .040" |
| 200 | 26.5" x 56" x .060" |

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## HEAVY SQUARING SHEARS — FOR SALE

2 Birdsboro 156"x½" Power Gap Shears, 15" Gap, Back Geared, w/extra blades.
PRICE .....$6,000.00 EA.

2 Hyde Park 156"x½" Power Gap Shears, 18" Back Geared, w/extra blades.
PRICE .....$4,750.00 EA.

*EXCELLENT CONDITION*
IN STOCK FOR IMMEDIATE SHIPMENT

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CRANE: Milwaukee 30 Ton 95' Span (New) with 15 ton Aux. Hoist.

PRESSES:
Z & H #7, 50 ton, Percussion
Bliss #6, 125 ton, Late
Clearing, 200 ton, Late
Bliss #310, 450 ton

Lake Erie, 750 ton, Hydraulic Bed 72"x140", single or double action, late (will draw 22")

ROLLS: BENDING
36"x¾" Pyramid
12"x¾" Pyramid
11"x¼" Initial
10"x¾" Roll leveller
BRAKES: PRESS
Cinci. 14'x¼" (late)
Cinci. 10'x¾" (1935)
Ohi 10'x¾" (old)
PLATE EDGE PLANER:
N & J 32"x2"
PLANER:
N B P 48"x48"x26', 4 heads
MILLER—PLAIN HORIZ.
K & T #4K (late)

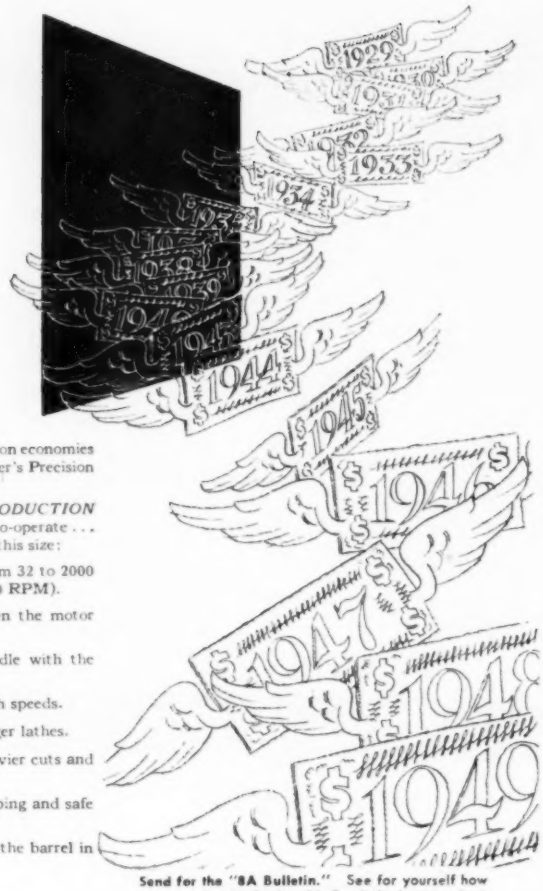
**KINGS COUNTY MACHINERY EXCHANGE**
408 Atlantic Ave., Brooklyn 17, N. Y.
Dept. A Phone: TRiangle 5-5237



Metal Forming and Bending Machine
#206-F Toledo 155 Ton D.C. Press, 3" Stroke, 20" x 110" Bed Area
#6-D Potter & Johnson Turret Lathe
12 Spindle Molino Automatic Drilling Machine
3 Spindle Molino Model 7-3 Cylinder Borer
1-A W&S Universal Turret Lathe
36"x14' Schumacher & Boye Engine Lathe
Libby 26"x41½" Spindle Turret Lathe
26" Stockbridge Shaper
Lees-Bradner CT 36" Thread Millers
Crankshaft Grinder
Foote-Burt 4 Spindle Drill #2 M.T.
24"—H.S. Milling Cutters (New)

**CONTINENTAL SALVAGE & MACHINERY CORPORATION**
1836 EUCLID AVENUE, CLEVELAND 15, OHIO
MAIN 4402

# Are you still paying for equipment you bought 20 YEARS AGO?




**YOU CERTAINLY ARE** . . . if you are losing the production economies you can obtain with the modern WADE No. 8A Toolmaker's Precision Lathe. Obsolete equipment is *expensive to own!*

You can *CUT your COSTS*, and *INCREASE your PRODUCTION* with the "8A", a lathe that is smooth-running, quiet, easy-to-operate . . . with features you would never expect to find on a lathe of this size:

**Variable Speed Drive,** with stepless spindle speeds from 32 to 2000 RFM. (With back gears engaged, speeds are from 32 to 220 RPM).

**Electric Tachometer** registers spindle speeds only when the motor is running.

**Clutch** permits you to start, stop, and brake the spindle with the motor running.

**Ample Torque** for low speeds; matched V-belts for high speeds.

**Rear Station Tool Block** previously found only on larger lathes.

**Ample Front Guideway** on the bed. You can take heavier cuts and obtain finer finishes, free of chatter!

**Thread-lock Spindle Nose** for accurate, positive clamping and safe driving of face plates or jaw chucks.

**Full-bearing Tailstock** has a bearing the full length of the barrel in any position.

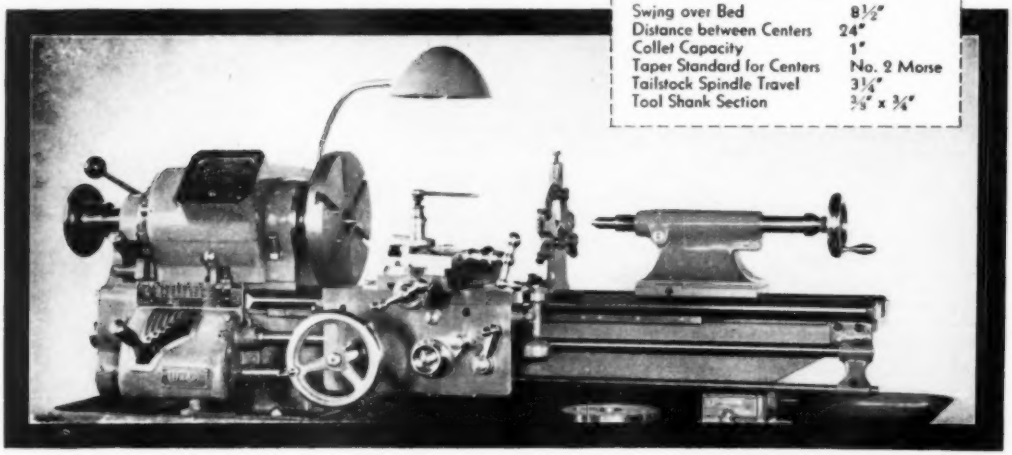
**Complete Electrical System** with reversible starter.

**Send for the "8A Bulletin."** See for yourself how you can save by having this fine lathe in your plant. You will understand why—more and more—"industry is turning the Wade way!"

**THE Wade TOOL CO., 53 River St., Waltham, Mass.**

## SPECIFICATIONS

| | |
|---|---|
| Swing over Bed | 8½" |
| Distance between Centers | 24" |
| Collet Capacity | 1" |
| Taper Standard for Centers | No. 2 Morse |
| Tailstock Spindle Travel | 3¼" |
| Tool Shank Section | ⅝" x ¾" |



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"Packaged Engineering"

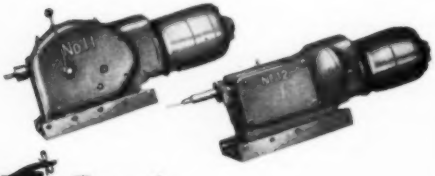
# uses every angle... to boost production

with Hartford Special

# AUTOMATIC DRILLING & TAPPING MACHINES

This machine drills 11 holes, counterbores 3, and taps 5 with nine drilling units and two tapping units. One drilling unit uses a four spindle attachable head, and one tapping unit has an eight spindle attachable head. The eight station dial indexing mechanism is motor driven, and the entire machine is electrically interlocked.

Hartford Special Drilling and Tapping Machines are designed to take the guesswork out of production. Packaged Engineering includes all the thinking and building necessary to put a self-contained unit in your hands. Sequence of operations and overall design are calculated to reduce waste motion and time to a minimum, yet keep the machine compact and simple to operate. These machines are built to be as rugged and foolproof as modern mechanical skill can make them, because a machine that is down is not producing. If you are considering a special single-purpose machine, you can be sure that Hartford Special will examine every angle to give your production a real boost. Write our Engineering Department now. The Hartford Special Machinery Company, Hartford 5, Connecticut.



*Remember*

For special applications, Drilling and Tapping Units with or without attachable heads are available individually.

**HARTFORD** *Special*

*...the standard for special machinery*

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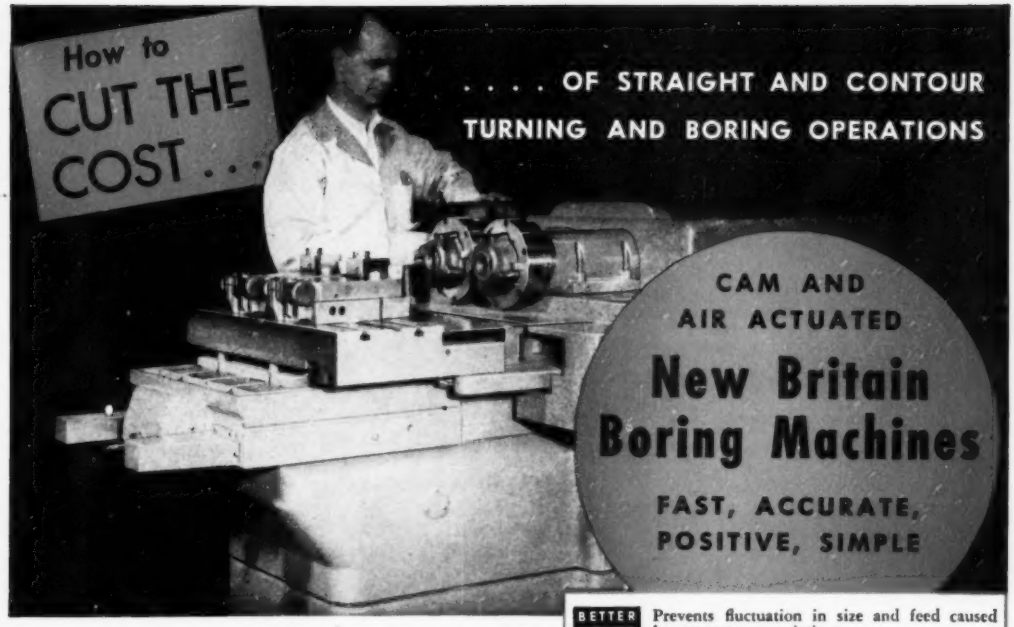


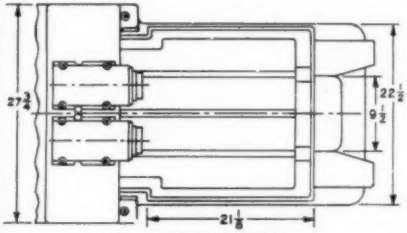

Generate straight bores, outside diameters and an unlimited number of different contours. Adaptable to both roughing and extreme precision finishing of pieces, limited only by the minimum diameter of the boring bar, and on large work by the table size. Operate at top spindle speed of 7500 R.P.M. Two speed drive makes it possible to change spindle speeds for different portions of the same job, to provide for differences in diameters and interrupted cuts.

Available in two sizes of two different models, one for straight boring and turning, the other equipped with contour table. One or more spindles may be mounted, and raised, lowered or spaced as required. Vertical cross slides optional for facing or other cross working operations.

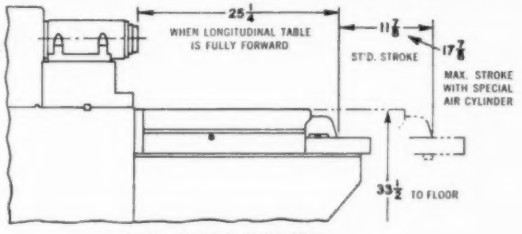
| | |
|---|---|
| BETTER METHOD | Prevents fluctuation in size and feed caused by temperature variations. |
| BETTER METHOD | Only one single point tool to buy, set, adjust and grind. |
| BETTER METHOD | Holds .0001 tolerances by reducing tool strain and work torque. |
| BETTER METHOD | Positive cam actuation reduces inspection to a single dimension. |
| BETTER METHOD | Rapid traverse to within a few thousandths of work, quick withdrawal, cut idle time. |
| BETTER METHOD | Optional automatic loading enables one operator to run more than one machine. |
| BETTER METHOD | Choice of tool or work rotating set-up makes tooling easy and flexible. |

**LARGE SIZE TABLE TAKES BIG WORK**

**Besides doing small work, these machines are capable of mounting large pieces on the tables as shown in the following tooling area sketches**




TOP VIEW OF TOOLING AREA




SIDE VIEW OF TOOLING AREA

The work capacity and flexibility of New Britain boring machines open up unlimited possibilities for finding the better production methods on which successful competition stands or falls. Write for full details, and the brochure, "IT CAN BE DONE" which describes actual cost histories on specific jobs.

649MK1

NB NEW BRITAIN

*Automatics*

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

# Le Blond singles out TIMKEN® bearings for new double-duty spindle

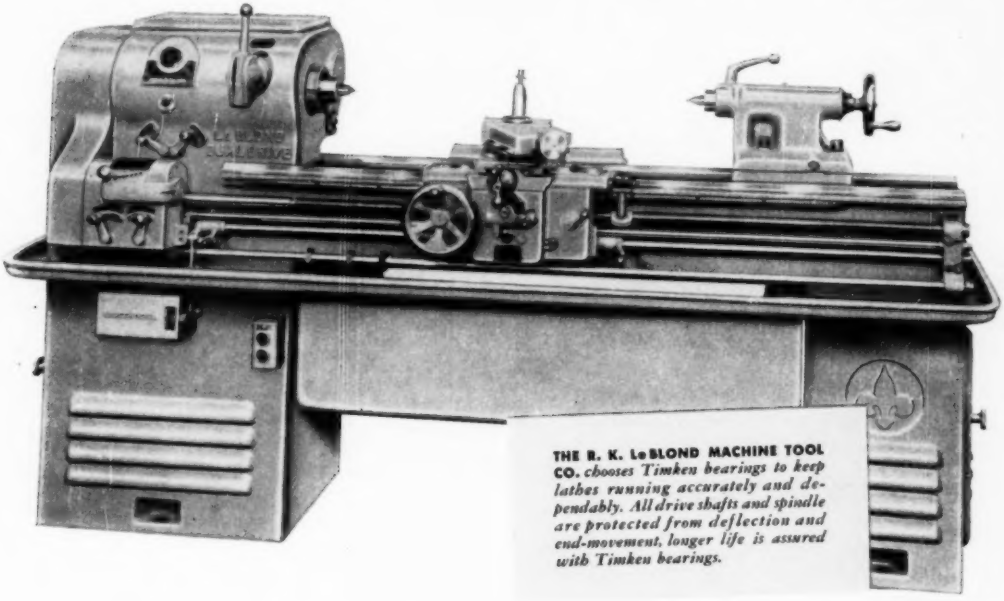
THIS LeBlond lathe—recently re-designed to include an electric brake and hardened and ground Timken® steel bedways—assures accuracy and trouble-free operation with Timken tapered roller bearings on the drive shafts and spindle.

The tapered construction of Timken bearings enables them to carry tremendous radial and thrust loads in any combination. Deflection and end-movement are eliminated. Accurate pre-loading is permitted to any degree. Because wear is negligible, Timken bearings enable spindles and shafts to retain their original accuracy over long years of service.

Maximum load carrying capacity is provided for Timken tapered roller bearings by line contact between the rolls and races. And both rolls and races are made of fine Timken alloy steel for toughness, case hardened for exceptional resistance to wear, finished to incredible smoothness for virtually friction-free operation. Normally, Timken bearings will last the life of the machine.

No other bearings give you *all* the advantages you get with Timken bearings. Whether you're a builder or buyer—make sure every machine is equipped with Timken bearings. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, O. Cable address: "TIMROSCO."

*This symbol on a product means its bearings are the best.*



**THE R. K. LeBLOND MACHINE TOOL CO.** *chooses Timken bearings to keep lathes running accurately and dependably. All drive shafts and spindle are protected from deflection and end-movement, longer life is assured with Timken bearings.*

**WITHIN ONE HALF A THOUSANDTH OF AN INCH!**

. . . that's an example of the accuracy demanded in the outside diameter of Timken bearing cups in order to pass inspection.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

**TIMKEN**

TRADE-MARK REG. U. S. PAT. OFF.

***TAPERED ROLLER BEARINGS***

TIMKEN 1899 50 YEARS 1949

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ⟂ AND THRUST → LOADS OR ANY COMBINATION